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# AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

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Vol. 31. 505 PEARL STREET, NEW YORK. No. 37.

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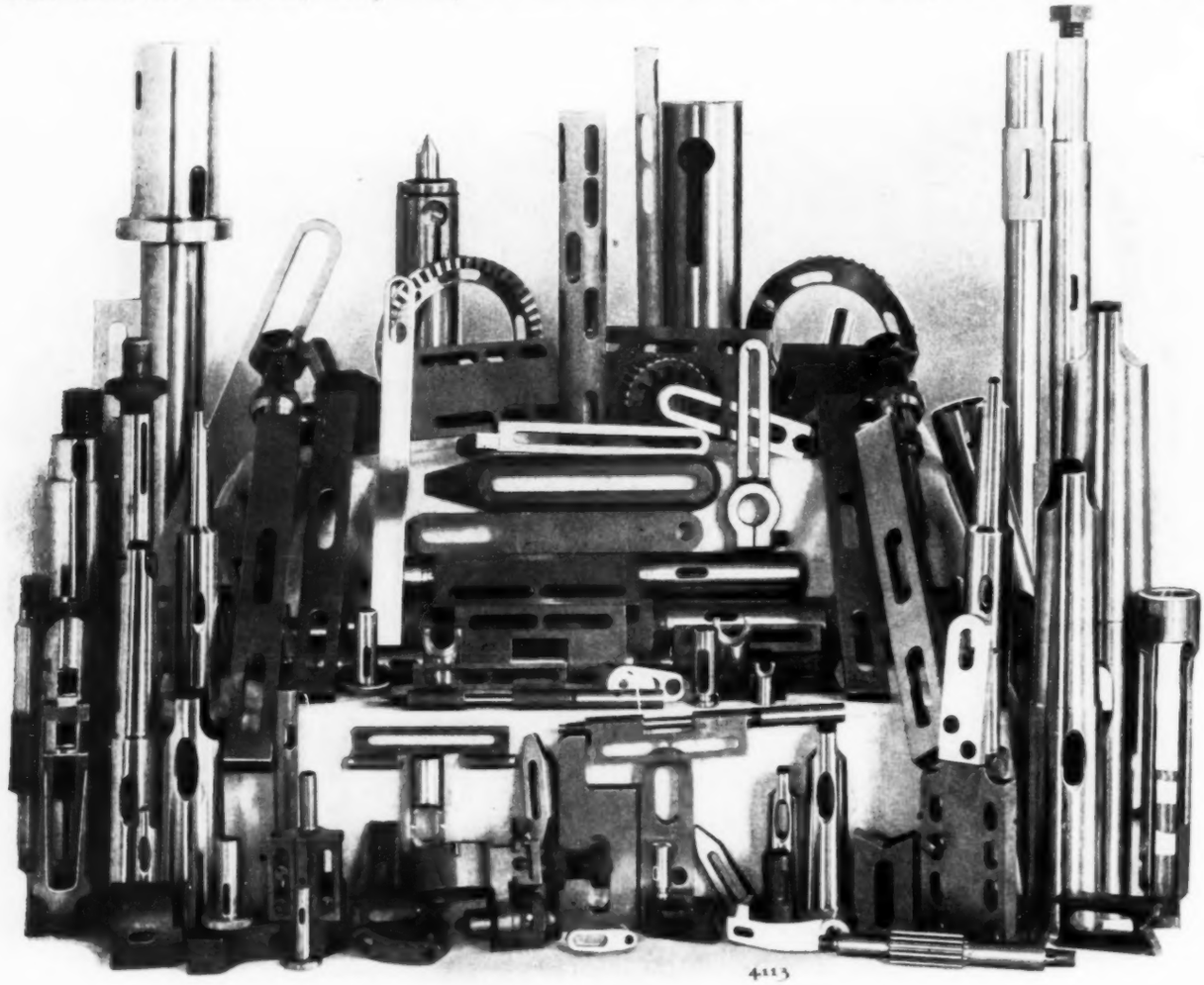


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**Complete description with illustrations, pages 1 to 5, American Machinist, July 2, 1908.**

*Write for new illustrated catalog "The Spline Milling Machine."*

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# Locating and Boring Oblique Holes in Jigs*

## Holes to Be Bored at Angles Greater or Less Than 90 Degrees with the Jig Body May Be Located with Spherical Buttons and Indicator

BY C. L. GOODRICH†

In Fig. 1 is represented a type of jig which the toolmaker frequently has to build.

The jig body and plate may first be carefully planed on all surfaces as indicated by finish marks, using ordinary methods and taking particular care to insure the base and sides being square and at right angles with each other. The accurate planing of the angular face of the jig body, to which the plate is attached, may be considered the next operation, and this may be accomplished by several different methods.

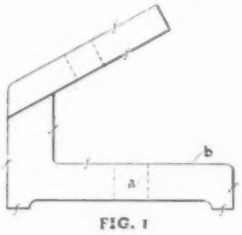
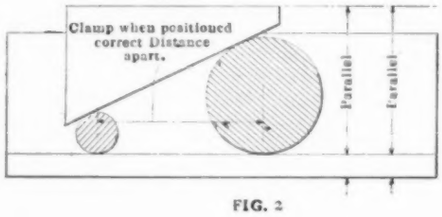


FIG. 1



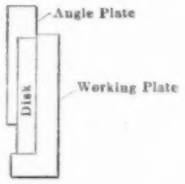


FIG. 2

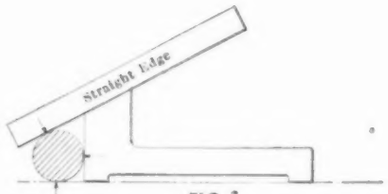


FIG. 3

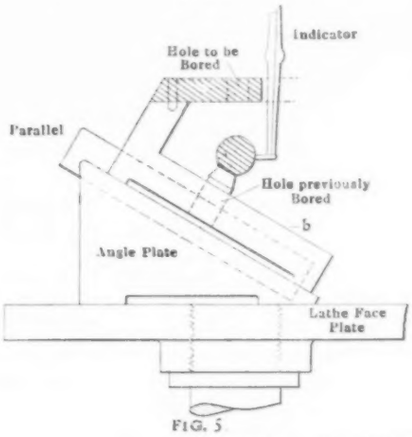


FIG. 5

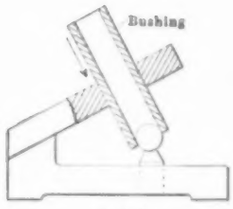


FIG. 6

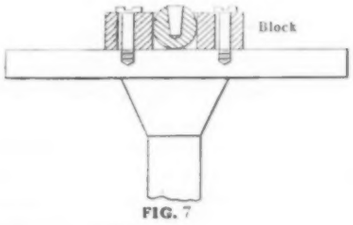


FIG. 7

LOCATING AND BORING OBLIQUE HOLES

### Setting Work for Planing

Fig. 2 illustrates an excellent way to position a plate correctly so as to plane or mill any desired angle accurately. An article on this method by Jas. Dangerfield appeared in the AMERICAN MACHINIST, at page 398, Vol. 29, Part 2, and for a full description the reader is referred to that article. Briefly, the method is to attach to a flat plate two disks of such a diameter and separated at such a distance that a piece of work if resting upon the disks, as shown, will be inclined with respect to the base of the plate at the desired angle. By planing the upper face of the work parallel with the base, the required angle will be produced assuming the lower edges of the two disks are parallel with the base of the plate.

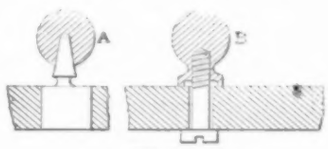


FIG. 4

The accuracy of the foregoing procedure is only limited by the expertness of the toolmaker, assuming the disk diameters and center distances are correctly calculated. It is obvious that the angular face of the jig body may be planed directly by holding the jig in the manner described, but in most cases it will be more convenient to produce a master angle plate by this method and to utilize the latter in correctly positioning the jig body when planing the inclined face and also when boring the hole for the drill bushing.

The application of cylindrical disks when planing the inclined face of a jig to a correct vertical measurement from the base or other surface and horizontally from the end of the jig body is illustrated by Fig. 3.

### Locating the Work for Boring

Assuming that the jig body and plate have been planed as outlined above, the next step may be to bore hole *a*, shown in Fig. 1, various methods for which have been described in these columns. The oblique hole in the plate may be bored after the plate is attached to the body or previously. In the event of its being considered advisable to perform the boring operation with the plate assembled, it is first necessary so to position the jig on the lathe face-plate (assuming a lathe is to be used for the boring operation) as to insure the inclined hole being bored at the proper angle and distance from the first hole bored in the jig body. The master-angle plate which has been prepared will give the required angular setting and a spherical button in connection with a test indicator, as shown by Figs. 4 and 5, will afford a means of properly locating the jig for the correct position of the hole. One edge of the jig base should rest against a parallel which is clamped to the edge of the master angle and the whole is securely clamped to the face-plate when the indicator point is stationary.

Assuming that the intersection of the axis of the two holes should be 0.625 inch from the face *b*, and also assuming that the spherical button is 0.5 inch in diameter, it is obvious that the end of the button should be 0.625 inch $+ \frac{.5000}{2}$ inches from face *b* in order that the center

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†Department foreman, Pratt & Whitney Company.

of the button be at the intersection of the axes of the two holes. The button if so positioned, and being a perfect sphere affording a continuous circular path for the indicator at all cross-sections, will thus be found an absolutely correct means in connection with the indicator of properly positioning the work.

### Locating the Jig Plate After Boring

Should it be considered advisable to bore the hole in the plate before assembling the two members, the ball button may be used in connection with a cylindrical locating bushing, as shown in Fig. 6, for properly positioning the two members before doweling together.

Ball buttons of various diameters are used, but on the ordinary run of work a diameter of 0.5 inch will be found convenient. Various methods of making accurate balls have been described, but it will be found entirely satisfactory to use commercial balls that are practically perfect spheres. A central conical hole should be bored in one side and the ball then mounted on a stem, as shown at *A*, Fig. 4. One method of boring the hole central is to clamp a block on the faceplate of a good lathe and carefully bore a hole in the block equal to the diameter of the ball, then push in the ball and either shellac or clamp the ball in place while boring the hole. Fig. 7 illustrates ball and holder.

### Resting the Work on Plugs and Hight Blocks

A variation from the preceding method which permits of dispensing with the angle plate is to bore four holes, for plugs, into the frame of the jig, as shown by Fig. 8. The plugs, which are temporarily used in place of the angle plate, must be of such diameter as to incline the jig at the proper angle. When planing and boring, the jig is supported by the plugs for the angular work. If the plugs are all of one diameter they should rest on hight blocks of suitable dimensions to produce results desired, as indicated by Fig. 9.

In either case it is, of course, necessary to position the four holes carefully and to calculate the dimensions of plugs and hight blocks accurately, and if no error has been made correct results should be obtained.

Still another method of locating a jig of the type described previously to boring the oblique hole and which does not require the use of a ball button, is first to locate properly by micrometer measurement an ordinary indicating button or disk, as shown by Fig. 10, in connection with a parallel and cylindrical plug and then indicate the work and clamp by ordinary methods. The master angle may be used to obtain the correct angular relation.

### Use of the Miller Table

The universal-milling machine with its graduated swivel saddle affords an excellent means of boring angular holes and of milling angular faces. In very accurate work the milling-machine table may be properly inclined by means of master angles or by parallels having disks of varying diameters positioned so as to produce desired results. In some cases the use of protractors is found the most suitable method of locating the table and work. Fig. 11 illustrates a piece of work

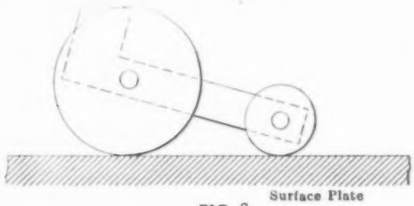



FIG. 8

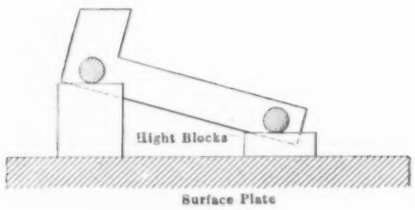
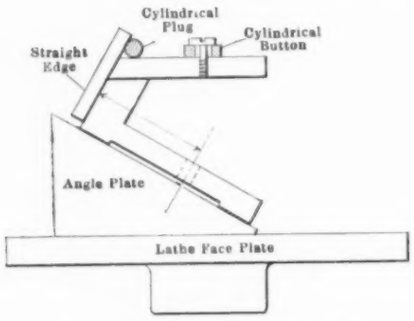



FIG. 9

SETTING ANGULAR WORK BY MEANS OF PLUGS



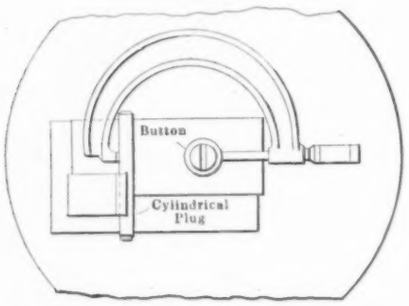




FIG. 10. USE OF MICROMETER AND BUTTON

FIG. 11

FIG. 12

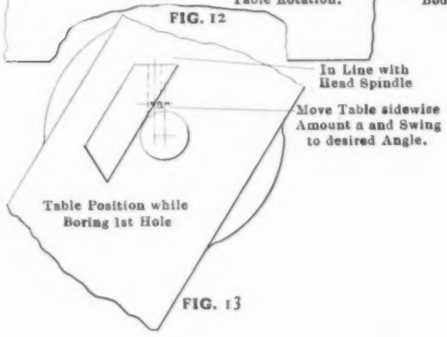



FIG. 13

FIG. 14

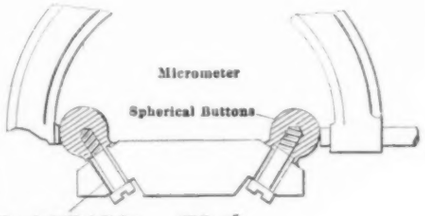



FIG. 15

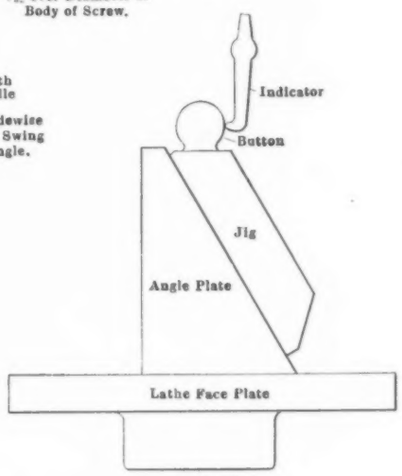



FIG. 16

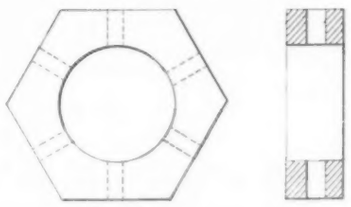


FIG. 17

OTHER METHODS OF LOCATING THE WORK

having two holes bored at an angle; the successive steps in boring by means of the universal-milling machine and its graduated swivel saddle being shown by Figs. 12, 13 and 14.

To the top of the table is clamped a disk so positioned that its axis is a continuation of the axis of rotation of the saddle.

The accurate positioning of this disk may be accomplished by clamping a sensitive indicator to some stationary point and adjusting the disk and partially rotating the table together with the disk until continuous contact between indicator and periphery of the disk shows no movement of the long arm of the indicator. The disk being of known diameter, affords means by which the correct longitudinal movement of the table may be calculated. For obtaining the desired longitudinal adjustment the use of a vernier attachment, or depth micrometer, will be found satisfactory for accurate work. Some prefer size blocks. On work of ordinary accuracy the regular screw and micrometer dial are commonly used, although the back lash must always be taken up in the same direction. The steps necessary to take and the entire scheme are self-explanatory from the figures referred to. It may be mentioned, however, that in many cases the disk may be made of a diameter that will permit the work to be so positioned with respect to the axis of the saddle that only swinging movement to the table will be required, thus eliminating the longitudinal movement altogether.

### Other Methods

Still another method that is found satisfactory when locating and boring holes in jigs of the type indicated by Fig. 12 is to use two spherical buttons attached to the jig, as shown by Fig. 15, and to indicate the work from the buttons in a lathe, as in Fig. 16.

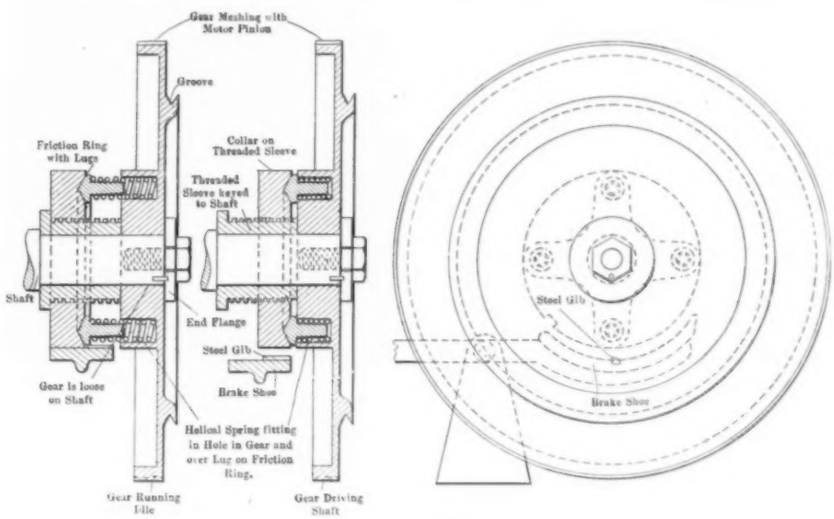
The indexing or dividing head of the universal-milling machine is very commonly used when jigs like Fig. 17 are to be bored. The work in this case may be mounted on an arbor between the dividing-head centers and indexed around to give the correct angular position of the various holes.

---

## A Spring-cushioned Clutch

By Albert Walton

It was desired recently to drive a certain machine by an individual motor which had formerly been driven by a belt through tight and loose pulleys. The load on the shaft is a heavy inertia load that is difficult to get up to speed but which, once at speed, runs very freely. In other words, the flywheel effect is large but the working and friction loads are light. The peculiarity in the operation of the machine consists in the fact that three times a day it is necessary to slow it down while allowing a loose pulley having a groove to run at full speed. From this groove, through a small rope belt, is driven a rotary brush for cleaning the surface of the slowly revolving machine. The machine must be slowly turning over and yet the brush must revolve at a high rate of speed. Furthermore, after this cleaning the machine must again be put in operation at full speed. With the belt device the machine was allowed to slow down by shifting the belt from the tight to the loose pulley. To resume normal operation the brush is disconnected by removing the rope belt. The main belt is then thrown back on the tight pulley, which brings the machine up to speed again.




A SPRING-CUSHIONED CLUTCH

### Conditions to be met by the Design

How to reproduce these conditions with a motor and a gear was a problem which I had to solve. It is necessary to make these shifts without shock to either motor or machine. Inasmuch as the machine normally runs continuously for a 10-hour day, with only the noon hour and the three cleanings as interruptions, it was very desirable to have a clutch in which no friction is introduced while in the running position. The usual forms of clutches held in by collars and forks were therefore unavailable. On account of the short time consumed in cleaning, friction losses were not of importance during that time. The cushioning of the shock incurred by throwing the nearly stationary load on the rapidly revolving gear introduced another feature which had to be provided for in the design.

To accomplish these ends the gear and clutch shown in this cut were devised and put into use.

### The Construction

The construction is much simpler than the cross-section would indicate. There are only four main parts: the loose gear with four holes cored around the hub; a flanged sleeve keyed to the shaft and provided with a square thread on the outside; a collar threaded so as to run on this sleeve, and a friction ring running in a *V*-groove on the side of this collar and carrying four lugs corresponding to the four holes in the hub of the gear. A brake shoe with a projecting gib is provided as a shifter. The gib engages a notch in the collar cut for the purpose.

### The Operating

The operation of starting is as follows: The motor switch is closed while the brake shoe is lifted from the face of the collar. The gear starts to revolve at nearly full speed. This carries the friction ring around with it since the four lugs on the ring project slightly into the holes in the gear. The friction of the ring against the collar turns the collar also. Since the machine shaft is at rest the collar is moved by the thread up toward the gear, compressing the springs as it moves. As the springs compress the pressure of the ring against the collar increases and with it the friction between them. This has a tendency to put a load on the motor and slow it down slightly. Finally the collar is run up by the thread till it presses directly on the hub of the gear, the springs having been driven back into the holes in the gear. This locks the gear to the shaft through the friction collar and sleeve and, because of the pressure from the tightly compressed springs, slipping will not take place. Motor, gear and machine now come up to speed together.

The operation of brushing the machine necessitates the following order of events. First, the switch is opened and the machine and gear allowed to slow down to about one-half speed. Then the shoe is pressed against the collar and the gib takes hold in the notch, stopping the collar instantly. The momentum of the machine continues to carry the shaft and

threaded sleeve around, thus screwing the collar away from the gear, reducing the friction again as the springs are released. When the collar has traveled half way across the sleeve it has also left the gib which is less than half the width of the shoe. The collar is now held from turning only by the friction of the smooth face of the shoe. It continues to run back till it strikes the flange on the threaded sleeve, when it again revolves with the shaft, slipping on the smooth shoe. The motor switch is now again closed. While the machine is thus being run slowly by its own momentum, a rope belt is slipped over the grooved pulley on the gear, which of course, is now running at full speed. This drives the brush which does the cleaning. It is a very short process, lasting not over 15 seconds.

To put the machine in operation again it is necessary only to raise the brake from the collar which, being thus freed, immediately starts toward the gear, compressing the springs as previously described. Thus while the clutch is in the running position the tension holding it in is internal and introduces no running friction. The friction arising from holding the clutch open is of no moment because of its short duration and also the shock of throwing in a direct-coupling clutch is avoided and the momentum and power are taken up without damage to machine, gear teeth or motor shaft.

This clutch is extremely simple and can be made in any size. The one which I made has a collar 1½ inches wide and about 8 inches in outside diameter and transmits with ease about three horsepower. Indications point to the conclusion that it would have readily transmitted at least double that amount without slippage. In the instant of closing the clutch the full momentum of the motor is absorbed with only just enough slip to prevent undue shock, which alone would indicate that its capacity is far above what it is called on to deliver while running.

---

Commander Davis, of the U. S. Navy, has invented a remarkable double torpedo, which was tested by the government authorities. The torpedo consists of three parts: a Whitehead torpedo, 16 feet long, a gun tube fitted into it, just as the torpedo tube fits into the submarine, and a projectile, which is driven from the gun by a charge of powder when the torpedo detonates upon contact. The projectile then penetrates the side of the vessel against which it is fired, and explodes by a time fuse. The idea is by no means a new one, but its success is rendered possible by using vanadium, which greatly toughens the steel tube. Commander Davis claims to have built a tube less than an inch thick, weighing only 350 pounds, but capable of projecting a 10-inch shell with an initial velocity of 1100 feet per second. At the official trials the torpedo tore a 6-foot hole in a target.

## Restoring Burnt Carbon Steel Tools

By George T. Coles

It has often happened when a man is busy forging and tempering tools that he gets one somewhat hotter than is good for the steel, and does not know what to do about it, so he lays it down until it gets cold; he then proceeds to heat it again to harden it; often he lets it cool down to about the right color; he then quenches it in the bath and tempers it, after which he is surprised if the tool fails and will not do the work expected of it.

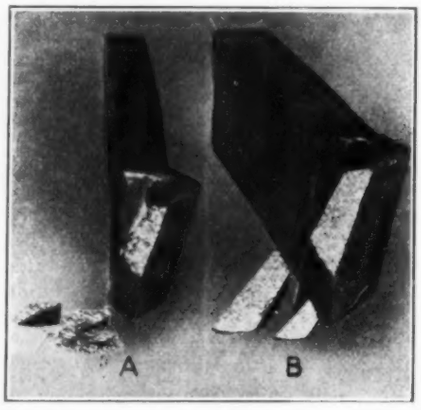



FIG. 1. TOOLS BURNT IN HARDENING

We also hear of all kinds of mixtures and nostrums for restoring carbon steel after it is burnt or overheated, but in all my experience I have never yet struck a restorative for burnt steel that would restore it like the treatment described below.

The accompanying half-tones show what has been done with carbon-steel machine tools after heating them to 2100 degrees Fahrenheit. That means a heat that is near the melting point

In Figs. 1 and 2 are shown two tools of which *A* is a side tool made from Howe Brown's steel and *B* is a side tool made from Jessop's cast steel. Both of these were forged and ground carefully; then heated to the 2100 degrees mentioned above; then quenched in a brine bath; then taken to a vise and the points inserted between the jaws. With very slight pressure *A* crumbled away in crystals, which were caught on a sheet of paper, as shown in Fig. 1, while the *B* tool shown in the same figure did not crumble, and did not show so coarse a grain, but broke very easily. The grain on *A* showed very coarse and sparkling bright, and would crumble away with very little pressure of the hands when closing the vise jaws, while *B* was a little harder to break.

Both tools were then taken and heated to 1100 degrees Fahrenheit, or a very dark red, and quenched in boiled linseed oil, after which they were broken as seen in Fig. 2. Considerable trouble was met with in breaking them, and the grain looks very good in the fracture, it being more like good steel. These tools were then ground to shape and hardened and tempered in the usual way.

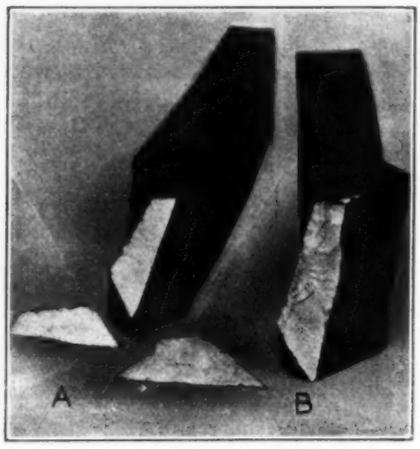



FIG. 2. SAME TOOLS AFTER BEING RESTORED

Fig. 3 shows *A* and *B* after being in use from December 17, 1907, to May 15, 1908, in the tool room on all kinds of work, from cast iron to tool steel, and lots of it. *A* is pretty well worn out, but *B* is good for considerable more of it. *C*, Fig. 3, is a side-finishing tool made from Jessop's cast steel, which went through the same treatment and has been in use since October, 1907.

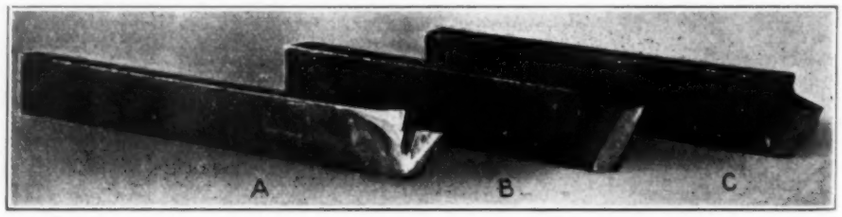



FIG. 3. SAME TOOLS AFTER FIVE MONTHS' USE

This treatment is very simple and inexpensive, with no nostrums or chemicals to be used and may be the means of saving a good tool, so that it can be used with satisfactory results. The grain refines almost as much as that seen in a piece of good steel that has been han-

dled with proper care, only it is of a lighter color and does not show the strength that a good piece of steel would show, but the cutting properties are there just the same, as the record of these tools show.

Sometimes a man has a lot of tools, of both carbon and high-speed steel, to harden and unless he has a distinguishing mark on them he is liable to make a mistake and treat a carbon-steel tool just as he would a high-speed one, and the results would be similar to that shown in Fig. 1. If this happens, he can, with this treatment, make the tool so that it will do its full amount of work.

## Trade Opportunities in Ecuador

By M. de Moreira

Though the chief industry of Ecuador is agriculture, it offers, nevertheless, a very good market for machinery and machine tools, for the simple reason that everything for which these can be used has just been started or just begun. Of course, a large portion of Ecuador is yet to be explored, particularly that part lying on the trans-Andean side, which possesses gold and other valuable mineral deposits.

The great difficulty in preparing to meet competition in Ecuador is that nearly all merchants have acquired the custom of purchasing from European manufacturers. This is due to the fact that European concerns extend larger credits than American houses. The country is growing, and the Germans and English realize that some help must be given to these new merchants, and thus in assisting them now, control in the future the Ecuadorian market. The last statistics show that the imports to that republic are valued at $6,708,439, out of which the United States shipped only one-sixth, thus proving the fact which I have just stated. The American manufacturers must, therefore, in order to change this situation, offer special inducements in the way of low prices and prompt and careful execution of orders. They will have to send their catalogs in Spanish, have agents who can speak that language, reduce their freight rates, and pay strict attention to the packing of their goods.

### Railway Building Just Beginning

Ecuador is just at the A B C of railway transportation. The best railroad they have is the Guayaquil and Quito railway. The repair shops on this new railroad, which connects the two cities and places them within 15 hours of each other, are very modest. The company has decided to increase their material, and as far as I can learn, this has not yet been done; as a matter of fact, the railroad was only finished last June.

Another important line is planned to the headwaters of the Amazon near the boundary. Another one is also started from Puerto Bolivar to Quito, and still another is under construction from Huigra to Cuenca, in the southern plateau of the Ecuador. All these will need railroad material, machinery and machine tools. What a grand opportunity for our manufacturers to make a scoop!

I think it will be of interest to American manufacturers to have more details regarding these roads so that they may study the possibilities of supplying most of the materials. I will quote, therefore, a paragraph from a report published lately: "While the connection of the capital and the interior with the coast was the prime object of the Guayaquil and Quito enterprise, a long section of the line is in the direct Pan-American location. From Huigra to Quito, a little more than 200 miles, the general Pan-American route is followed. The completion of this Guayaquil and Quito railroad makes it feasible to enter upon the construction of feeders, and these will be the necessary links in the Pan-American system. In order to secure the traffic of southern Ecuador it will be necessary to build a line from some point between Huigra and Guamate to the city of Cuenca, a distance of 92 miles, and this will be along the Pan-American route. Surveys have been made for this purpose, and President Alfaro will take measures to provide means for the Cuenca prolongation. After the southern section is finished the effort will be made to prolong the line from Quito to Ibarra, 97 miles to the north along the inter-continental location."

Surely these are great opportunities, which, studied in time, can secure for American manufacturers orders, which otherwise will go to England or Germany. In city transportation also, our manufacturers will find a market for their machinery and machine tools, as the work on electric tramways is just started. Electric lighting has been applied in Guayaquil and its suburbs. It is proposed to generate electric power through the agency of the mountain streams, or of those at the foot of the Cordilleras, some 55 miles away.

Machinery for the new water-works system of Quito and Riobamba should be furnished by our manufacturers, since the contract has been awarded to a United States engineer.

### Proposed Steamship Lines

Lately a syndicate of capitalists from Guayaquil has been formed for the establishment of a line of steamers which are to ply along the west coast to the Peruvian and Chilean ports. These steamers must have a capacity of 500 tons, their speed must be of 12 to 15 knots, and they must be built with refrigerators for the preservation of fruits. According to the latest information the contracts for the construction of these steamers have not yet been given out. The running of this line will naturally necessitate repair and building shops with uptodate material. Besides this line another, smaller, it is true, is planned for general trade between Guayaquil and Panama and intermediary ports. This line will be subsidized by the government.

The establishment of an ice plant is also planned for Guayaquil; the existing one is either too small, or is not equipped with sufficient modern machinery.

Besides all this, manufacturing interests in Ecuador are represented by 22 flour mills, one sugar refinery and several textile factories. The facilities for international commerce are provided by means of draft on London and New York, but, as in all the other South American republics, the establishment of an American bank is very much needed. There are four banks in Guayaquil corresponding to our national banks here, and, of course, some private banks, but an American banking house would facilitate matters a great deal for both the buyer and the exporter.

## Accurate Planing So As to Avoid Unnecessary Scraping

There is a growing feeling, in many places, that planer work might well receive more careful attention so as to eliminate much of the scraping that has long been considered a necessary part of the work. Nearly all agree that too much scraping has been done in the past, which means that too much has been left for the scraper, but the question as to the least scraping that is permissible would probably not receive the same answer in any two shops.

While it seems at first sight as though it ought to be much easier to plane a piece straight than to scrape it exactly right, experience has taught us that the average planer leaves a piece far from being exactly straight. Just how much of the trouble comes from improper clamping of the work, to the springing of the casting after the skin is removed on one side and to the inaccuracy of the planer itself is not easy to settle.

The experience of the Landis Tool Company, Waynesboro, Penn., however, may throw a little light on the subject and at least shows an experience in one shop, which is noteworthy and well worth careful consideration.

Taking grinding-machine beds and other of the larger parts as an example, they first rough-plane all the surfaces that require planing, then take the piece off the planer and do all drilling, milling, boring and chipping that is to be done.

Then comes the final planing, on a special planer kept for this work, and mounted on adjustable wedges so the bed can be kept in as nearly perfect alinement as is possible. No roughing work

is done on this planer and the work is held in fixtures specially designed to avoid springing in any way. The finishing planers are tested every week with a precision level purchased purposely for this work to be sure they have not yielded in any way to affect the alinement.

As a result of this care in the finish planing of the parts, the Landis company estimates a saving of about 80 per cent. over scraping. Not that scraping is entirely cut out in many cases, although it is in some, but the time required to get a perfect bearing has been so much reduced that the force of scrapers is very much smaller than you will find in many shops of this size and the work comes along in splendid shape with very little delay. It is simply a case of its being cheaper to rough-plane the castings and do all the other work before the final planing, than to save a little time on the planer and spend a lot more scraping down to a bearing.

## Square versus Round Tool Posts for Turret Lathe Cut-off Slides

By J. H. Thompson

This is a subject which has not received attention commensurate with its significance, in my opinion; for while the round type of tool post, shown in Fig. 1, seems to have grown in popularity in recent years for capstan lathe cut-off slides, yet the square type, shown in elevation in Fig. 2, and in plan in Fig. 3, has many points of superiority to recommend it. It has not been adopted to the extent which one would reasonably expect; one reason is its somewhat more expensive method of construction.

With the continual tightening and slackening of the clamping screw in the round type, the overhanging tee slot lugs *B*, are liable to get cracked and broken off, especially if the bottom of the washer *A* is not a solid fit on the part *B*, due to dirt or small chips between the faces. How many of us have had the annoying experience of having to shape off the broken edges, and rivet on wrought steel ones? I have seen this take place several times, whereas I never remember seeing one break off at that point when using a square tool post.

One point of superiority in the round type is the ease with which it can be set at the required angle; one screw is sufficient to secure both the tool in position and to clamp the post firmly to the rest. This feature has certainly gone a long way to make this type popular. It is quick in operation which is an important item in these days of keen competition. On the other hand, when it has once been set at a given angle and the tool removed for grinding, it has to be reset again to get it into the same exact position. With the square type it is not necessary to disturb the alinement of the tool when taking it out to grind. Although two screws *C C* are required to clamp the tool it does not follow that it is a longer job to set the cutting tool in position, in fact the reverse is often the case.

One feature about the square type, which operators do not like, is that the two small tool-clamping screws *C C* are somewhat cramped for headroom when using a spanner, especially on the smaller sizes, the large central clamping nut obstructing the free use of the wrench. This is generally gotten over by using a box wrench. Another annoying item is that the screws are small in diameter, generally about ¼ inch, and are liable to break off if too much pressure is applied. On the other hand, the square type is more rigid when clamped in position than the round pattern, as it has a larger area in contact with the top of the slide.

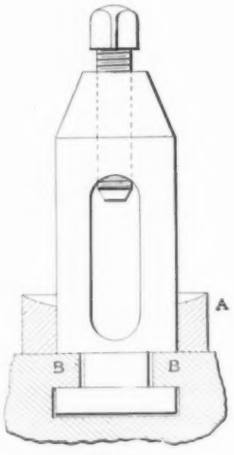


FIG. 1

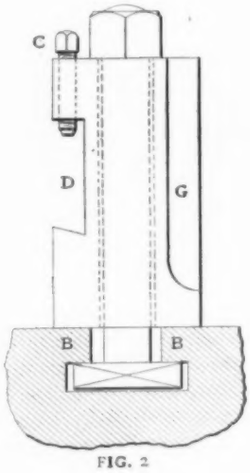


FIG. 2

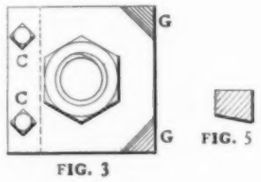


FIG. 3

FIG. 5

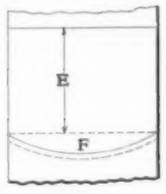


FIG. 4

SQUARE *versus* ROUND TOOL POSTS FOR TURRET-LATHE CUT-OFF SLIDES

One of the greatest advantages of the square type is that you can use a straight sided tool, which is comparatively cheap to forge, to face up against a collar; whereas with the round type an offset or cranked tool is necessary.

Fig. 4 shows the front view of the tool slot in a square tool post; the distance *E* is gashed across with a milling cutter to width and depth, the circular part *F* below the dotted line is recessed out in the lathe. A number of the tool posts fitting in a circular jig allows them to be done with accuracy and despatch. Fig. 5 shows a section of the packing piece for the tools to rest on. It will be noticed that this has a tapered bottom edge where it fits in the post. This prevents it from falling out when the tool is taken out to grind; the angle of the taper is usually about 15 degrees.

The square tool posts are generally made out of square bars, first sawn off to length, and then milled up to size in a miller. To give them a finished appearance they are often milled across the two back corners, as shown at *G* in Figs. 2 and 3, to within a short distance of the bottom. For this operation they are turned ⅛ of a revolution in the vise and the same cutter used which mills the sides. While most firms now fit the round type of tool post for cut-off slides, the square type has many supporters, and some very old established concerns still fit it in preference, and consider it more suitable for the work.

## Two Awkward Shop Jobs

By John E. Sweet

J. E. Johnson, Jr., manager of the Princess Furnace, Glen Wilton, Va., one of your contributors, had occasion to bore a large split pulley, too large to go under the drill press and too small to go outside the post, and the drill press was the only machine he had on which to do the job. He accomplished it in this way: He put the two halves together and laid out the hole, secured each half separately to the table of the drill press and bored a half at a time. He says he was in the same fix the otter was when he climbed the tree; he just had to.

He had another case where he circumvented the job in a rather unusual way, and it was cutting a keyway in a shaft, too large to go under the ram of the shaper, and too far from the end to reach in the ordinary way. He held the shaft in the vise on one side of the machine, rolled it so the keyway pointed toward the king bolt in the swivel head, then tipped the head over to the same angle and shaped the keyway all right with a tool long enough to reach. Fortunately the shaper post was pretty thin sideways.

# Making Forces for Embossed Work

By Chester L. Lucas

The process of die-sinking relates to the engraving or sinking of the female or lower dies, such as are used in the press-working of metals for jewelry, silverware, novelties, etc., and for producing raised lettering and ornamentation upon name-plates, tin boxes, pails, and similar work. The process of force-making relates to the making of the male or upper die to be used in connection with the lower die in stamping the metal.

With the exception of large shops where very much embossed work is produced, there are few manufacturing concerns which employ die-sinkers, consequently embossing dies are usually sent out to a regular die-sinker, who engraves or sinks the lower die and returns it after hardening, his part of the work being done.

Next, the force has to be made, and this cannot be done by the die-sinker in his little shop for two good reasons. First, in most cases he has no drop-press suitable to "strike up" the force, and secondly, the force properly made should be struck up in the press in which the dies are to be worked. Consequently this work usually falls to the lot of a machinist or toolmaker in the shop using the die.

Forces may properly be divided into two classes, those made of steel, and those made of copper. The easiest type of steel force to make is that which is termed a flat force, which should be used in cases where a flat back is wanted on the embossed piece, or where extreme lightness is not desired. In such instances, a stronger piece is produced, but thicker stock must be used to make the work than it would be necessary to use where the regular style of force which follows the design of the die is used (see Fig. 11).

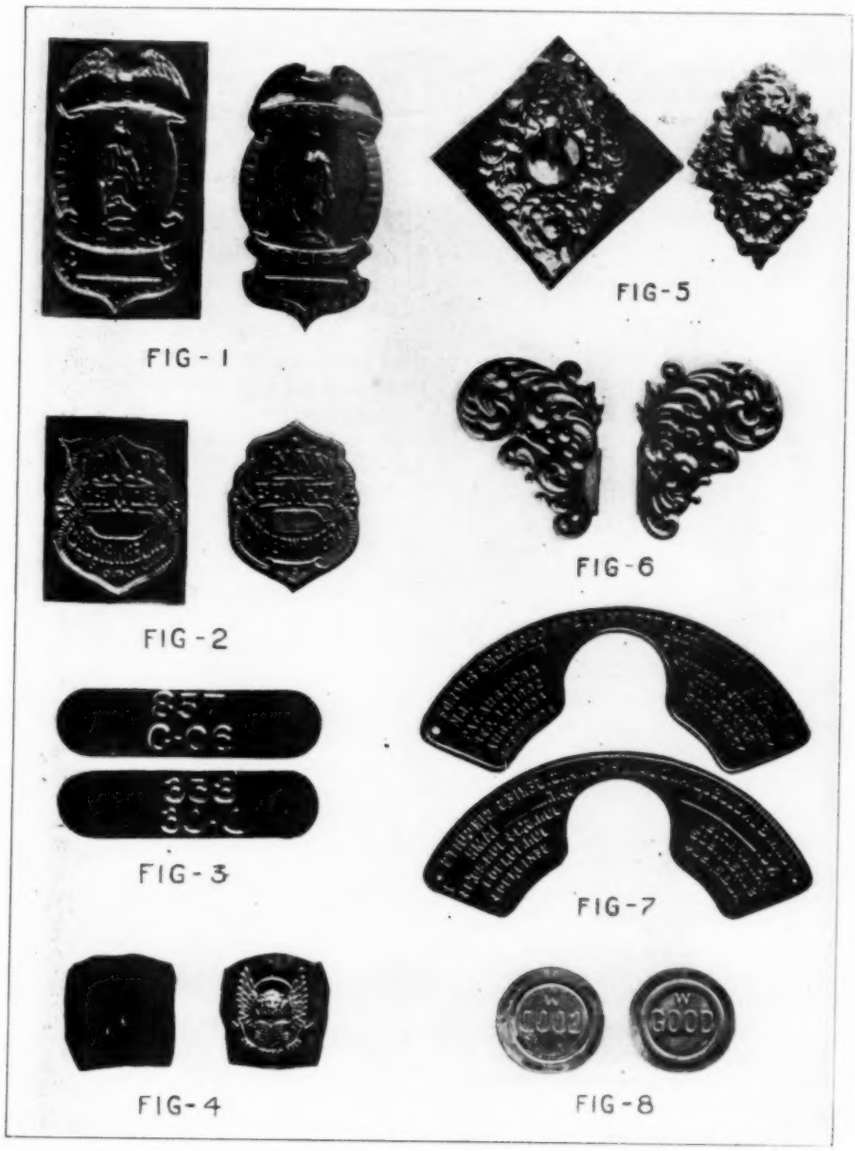
In cases where the design is fairly regular and not long and narrow in outline, the flat force is made by taking a piece of round tool steel of about the same size of the largest dimension of the outline of the design and about one-half longer. For example—a flat force for a design whose longest dimension is 2 inches, would require a piece of 2-inch round steel, 3 inches long. This piece of steel should be held in the chuck of a lathe and turned egg shape, or oval, on each end (see Fig. 10), and one end should be finished so that it is free from tool marks. Most drop-presses are fitted with a jack or "pick-up" die, such as is shown in the illustration (see Fig. 9), by means of which all except large forces are held. A flat block of hardened steel should be lined up central with this "pick-up" and firmly held there by means of the poppet screws on the press. The blank for the force should now be heated to a bright red and placed upon its finished end upon the lower die and then struck as hard as possible with the press; this will cause the force to imbed itself in the "pick-up," and it should now be rapidly struck enough times to spread it to the required size, then pried from the "pick-up" and hardened, and the temper drawn to a light straw color.

If a force is wanted which will carry the metal into the die and thus produce a thin light stamping, the same method should be followed, except that in place of the block of hardened steel held on the bed of the press by the poppet screws, the lower die should be substituted, lined up and held as before. In making this style of force, care should be used to keep all scale from getting on the face of the die and spoiling the force. If the design of the die is deep it may be necessary to use two or more heats, in which case the force should be removed from the "pick-up" and reheated, then fitted into the lower die as rapidly as possible and at once struck. If done properly, it will lift with the pick-up and should now be struck until every detail of the die appears on the force.

When the shape of the outline is long and narrow, the steel blank should be of the diameter of the greatest width of the design, and about 1 inch longer than its length. The whole length of the piece should be finished smooth, as this piece, after heating, must be laid sideways on the die when striking it.

The reason for always leaving the most stock in the center of the force blank is that the center of the design is always the hardest to make "come up" sharp, consequently we leave the stock thickest there so as to help it all possible. Also a piece of this shape is easily "picked-up," which would be almost an impossibility with a flat piece of steel.

Steel forces for flat work such as name-plates, tin-can work, etc., require very careful work, and while they can be made by the method already described, it is not




EXAMPLES OF EMBOSSED WORK

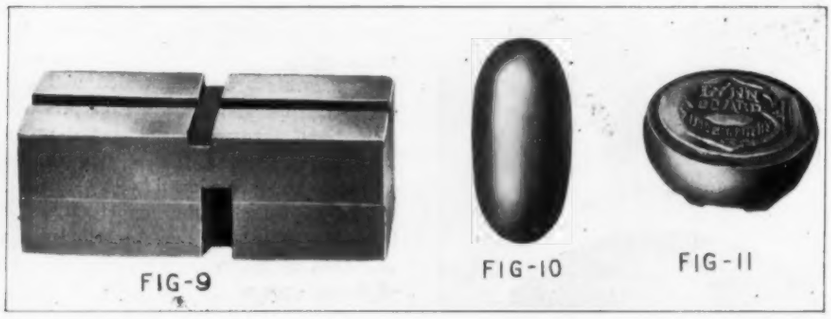
the best way for the reason that the steel being struck into the die while hot shrinks upon cooling, and results in a force which will not fit the die as it should. This shrinkage is also noticeable on all hot-struck forces, but matters little where there is any depth to the die. One method of overcoming this trouble is to strike the force in the die (after it has been brought up enough) every few minutes until the force has entirely cooled, but where the impressions in the die are so very shallow, like the letters of a name-plate, the corresponding letters on the force are very apt to be obliterated during this process, and so make the force useless.

By far the best way to make such forces is to start with a plain piece of steel whose face is the exact shape of the outline of the name-plate, and this should be beveled off toward the back of the piece about 10 degrees. The thickness of this piece should be from 1 to 2 inches, according to the size of the name-plate.

This piece should now be given a thin coat of solder on its face and then it should be carefully placed face down upon the die it is to fit, taking care that the outline of the force matches up with the design on the die. After placing both die and force under the drop hammer it should be struck one solid blow, and only one. In doing this part of the work it is not necessary to fasten the force to the hammer of the press, but the die should be fastened to the press bed in the ordinary way. This being done, the force should be taken from the die, and it will be observed that the imprint of every letter of the die shows upon the solder coating on the force, which must now be held in the vise while the solder and steel around the letters should be removed with small chisels until only the letters are left standing. The force should now be fitted into the die and struck again, after which the solder on the tops of the letters may be filed off, leaving still a good impression on the steel force. The chipping process should be repeated and then struck again until the back ground has been sufficiently taken away. The back of the force may now be dove-tailed so as to be keyed in the press, as the pick-up cannot be used with this method of force-making. In some shops, forces are held to the head of the press by means of screws, but this is not good practice, as the constant shock and vibration of the press in operation tends to loosen them or snap them in two.

The chipping out of forces can be greatly helped by using punches of various shapes; especially are these useful in driving down the stock in the centers of the letters and other places hard to chip out.

Copper forces do not require nearly as much care to make as steel forces, as they are always struck in the press. While it is often necessary to strike copper forces hot, they can many times be made cold, which way is to be preferred, as the copper is much harder when struck cold, consequently the force lasts longer when in use. The stock for a copper force does not need to be round as it "comes up" when struck very easily. Copper forces are always held in the pick-up and have the advantage that they may be struck into the die at any time while in use and thus sharpen up the details of the design as they become worn.




PICK-UP DIE, FORCE BLANK AND FORCE

In the absence of copper, brass is sometimes used for small forces, but it cannot be struck hot like copper and it splits easily if struck too hard, and for these reasons is undesirable, though it can be used in an emergency.

In the illustrations of embossed work, some of which have been trimmed and some not, Figs. 1 and 2 illustrate german silver stampings for badges; Fig. 3 shows a thin copper label struck up with a copper force; Fig. 4 is a copper ornament struck with a flat force as will be seen in the reverse side illustration; Figs. 5 and 6 show examples of stamped belt buckles; Fig. 7 is a name-plate of brass made with a force which was made by the chipping process, as described, and Fig. 8 shows a very light aluminum label made with a copper force. In the illustrations two cuts of each piece are shown, face and reverse views.

Fig. 9 shows one style of pick-up die; Fig. 10 illustrates a force-blank ready to be struck, while Fig. 11 is a typical force, and was used to produce the stamping shown in Fig. 2.

## Rule with Center Plate for Scribing Circles

By M. Eggand

Herewith is shown in Figs. 1 and 2 a simple tool used much by patternmakers and machinists, and commonly called a

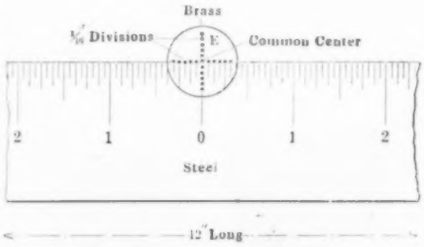



FIG. 1. CORE-BOX CENTER RULE

core-box center, with some improvements that make it a valuable addition to every patternmaker's kit provided they are not of the borrowing type of mechanics. It is simple, requires little time to make and is used nearly every day. This tool I have made in wood and steel, the wood with a 24-inch head, the steel with a 12-inch head. The wood has no graduation but the steel is graduated in sixteenths, from each side of the center marked zero. The brass plate *E* is marked with a fine center punch at zero and every sixteenth of an inch from the center as shown in Fig. 1. A half circle can be scribed on the end of a block for a core box after the center has been cut away, by placing the point of the dividers in zero, or it can be made eccentric by using any of the other punch marks for a center.

If it is wanted to enlarge a core box that has already been cut out, simply set the dividers to the required dimension

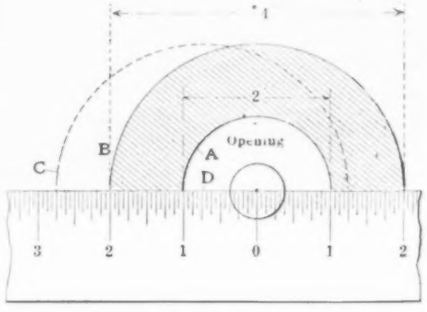



FIG. 2. THE RULE IN USE

and place the center head against the face of the core box and scribe the circle required.

In Fig. 2 is shown the way it can be used to scribe half circles eccentric to the center of the opening. To scribe circle *B* above circle *A*, which has been cut out, place the 1-inch divisions at each edge of circle *A*. If the eccentric circle *C* is desired simply slide the tool along until the center comes to the point *D*.

# Piping Oil to Several Hundred Machines

## Methods Used by the Standard Tool Company for Overcoming the Clogging of Pipes with Chips by Means of Open Gutters and Filters

## EDITORIAL CORRESPONDENCE

With any system of piping it has always been a difficult problem to supply a large number of machines with oil to keep the metal and tools cool while turning work, or machining it in any other way, but the Standard Tool Company, of Cleveland, Ohio, has solved this problem in a very simple and efficient manner.

The main difficulty which was encountered in many systems was the clogging of the pipes by the chips, waste and other solid substances which would almost invariably get into the pipes. This caused many shops to abandon an expensive system of pipes, pumps, etc., and return to the old system of a pump, pipes and strainer or filter for each machine.

FIG. 1. LOOKING WEST IN ROOM SUPPLIED BY OILING SYSTEM. MACHINES ARE FOR MILLING SMALL DRILLS

In the room shown by Figs. 1 and 2 several hundred machines, for milling the flute in drills, are fed by gravity with oil from a centrally located tank. This room is right-angled in shape and the tank is located on the ceiling at the corner of the angle. A part of the tank is shown in the extreme upper left-hand corner of Fig. 1.

In Fig. 1 is seen the part of the room running westward; the bench in the foreground extending down the other bay of the room. The end of the room extending northward is shown by Fig. 2 and the balance of the bench shown in the foreground of Fig. 1, is seen back of the line of posts which support the floor above. This room, like others of this company's plant, is remarkable for its cleanness. All of the machines, as well as the walls, ceiling, partitions, etc., are painted white and this with its goodly supply of windows makes it very light and airy.

### Open Gutter

The secret of supplying so many machines with oil from a central station, and using this oil over and over again, consists of having an opening in the pipes which carry the used oil from the machines to the filters. The ordinary gas pipe has been cut away at the top for nearly its entire length to form the opening; only enough round stock is left on each end of the pipe, to make the necessary connections with couplings, elbows, etc. Enough of the pipe is cut away to make it U-shaped and then when waste, chips or other substances get in and stop the natural flow of the oil, they can be seen by the machine operators and easily taken out. This principle of the open gutter to carry the oil, that has been used, away from the machines has made this piping system a success and it is very seldom that any of it has to be taken apart for cleaning.

The open gutter is shown directly under the front end of the bench in the foreground of Fig. 1 and the bench which runs down the room to the right of the same cut. It is also shown on the bench to the right of Fig. 2 and on a larger scale in the foreground of Fig. 5.

On the bench running lengthwise of the room and to the right of Fig. 1, the gutter is shown extending from both ends of the bench to the center. At this point there is an opening in the bench so you can pass from one side of the room to the other. This is best shown by Fig. 3. Here the oil flows down through elbows and valves to the filter which is located directly under

FIG. 2. LOOKING NORTH IN ROOM SUPPLIED BY OILING SYSTEM. MACHINES ARE FOR MILLING SMALL DRILLS

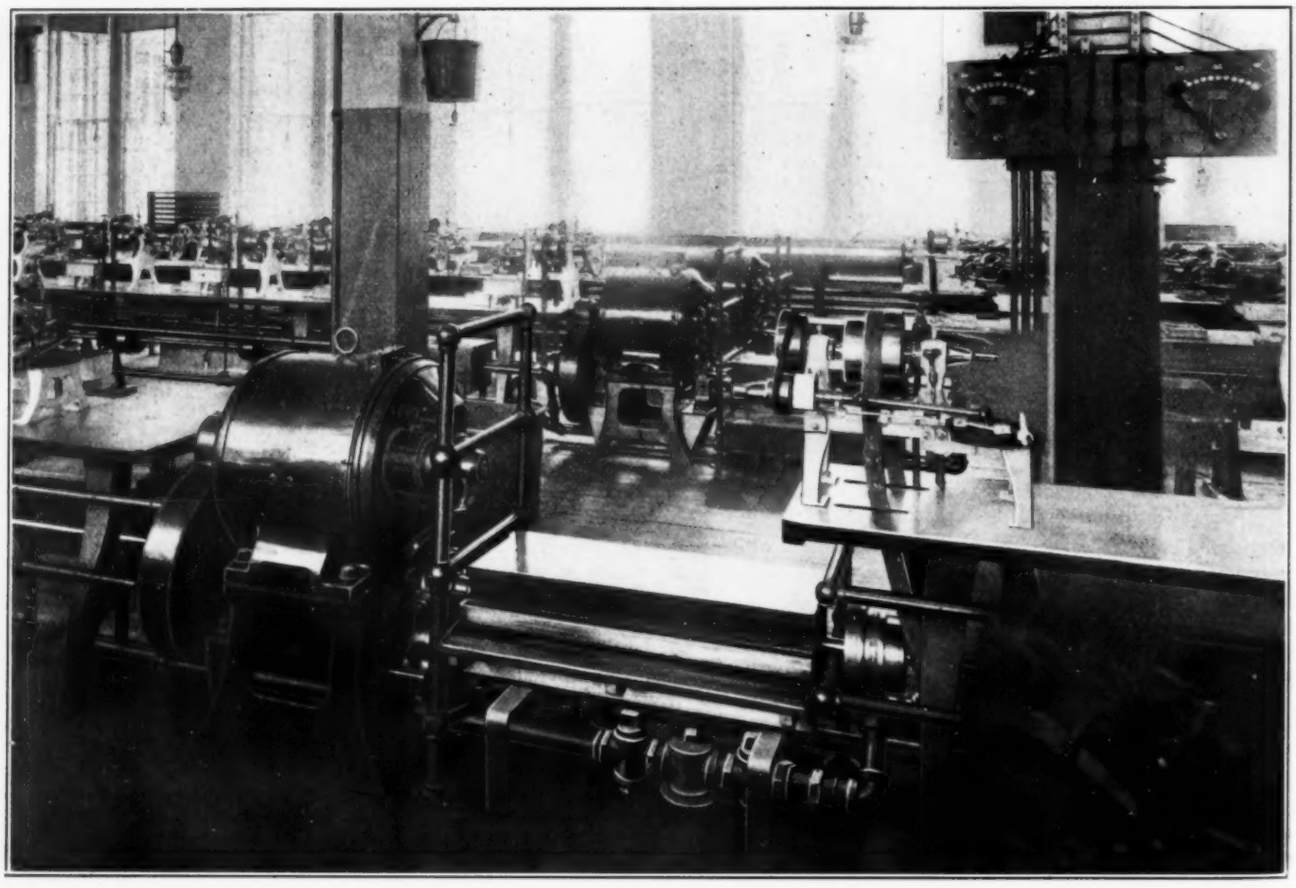


FIG. 3. VALVES AND PIPING FOR OIL SYSTEM; ALSO MOTORS FOR DRIVING LINE SHAFT UNDER EACH BENCH

the floor, and from there it is pumped to the overhead tank, from where it again flows by gravity through the machines and back to the filter.

In Fig. 3 is also shown the motors used to drive the machines. These are started going from the switchboard seen on the post and drive the machines with a shaft that is located under the benches. This leaves the room with no overhead belts as shown by the view of the west wing in Fig. 2. In the north wing shown in Fig. 1 are a few overhead belts to provide power for the machines used by the toolmakers, who occupy benches, in front of the windows, on both sides of this wing.

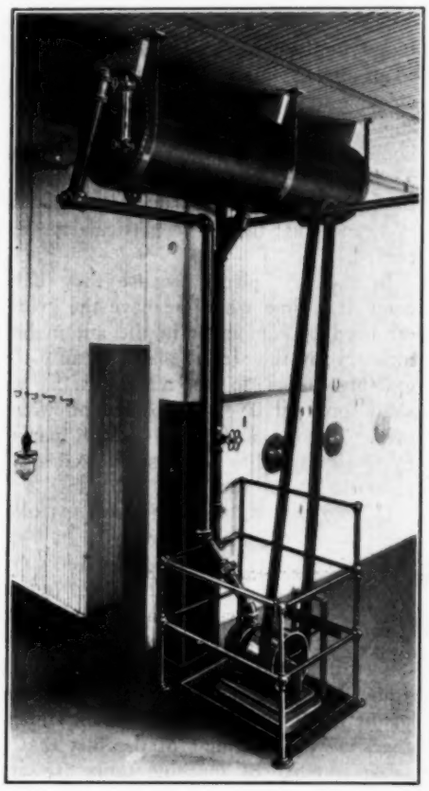


FIG. 4. PUMP AND OVERHEAD TANK FROM WHICH OIL IS FED BY GRAVITY

Steps are provided so you can walk over the driving shaft, as shown in Fig. 3, and the lower step is hinged so it will fold back and allow access to the valves and connections of the oil pipes.

In Fig. 4 is shown the pump and oil tank. As will be seen the pump is located on the floor and takes the oil from the filters which are underneath it and forces it into the tank overhead. This pump may appear to be too small to take care of the oil from so many machines but it is amply sufficient to do the work required of it, and the tank has a large enough capacity to supply all of the machines in the room. The tank has a glass gage on one end of it so the hight of the oil in said tank can be seen from the floor.

This pump and tank are located in the corner of the room from which the wings extend to the north and west of it, thus making it centrally located.

### Testing Oils

Before putting a fresh supply into the tank, each shipment of oil is thoroughly tested, and it is needless to say that oils frequently have to be returned, owing to their not having the body and lasting qualities that are claimed for them by the salesmen.

To test the oils 5 gallons is taken from the barrel and used in actual work on the machine shown in Fig. 5. This machine has its own pipe line, pump and filter and is not connected to the oiling system which covers the rest of the machines in the room. Thus the oil is tested under the actual working conditions met with in the rest of the room and if the 5 gallons lasts the required or standard number of hours the shipment from which it is taken is accepted. As will be seen in the iron box to the left of the machine, the finished work is placed in it, on an angle, and left until the next morning so that all the oil will drain off. This with the oil from the machine runs into the filter and tank, on the floor under the machine, and from this it is pumped back to the work, through the pipe shown in front of the machine.

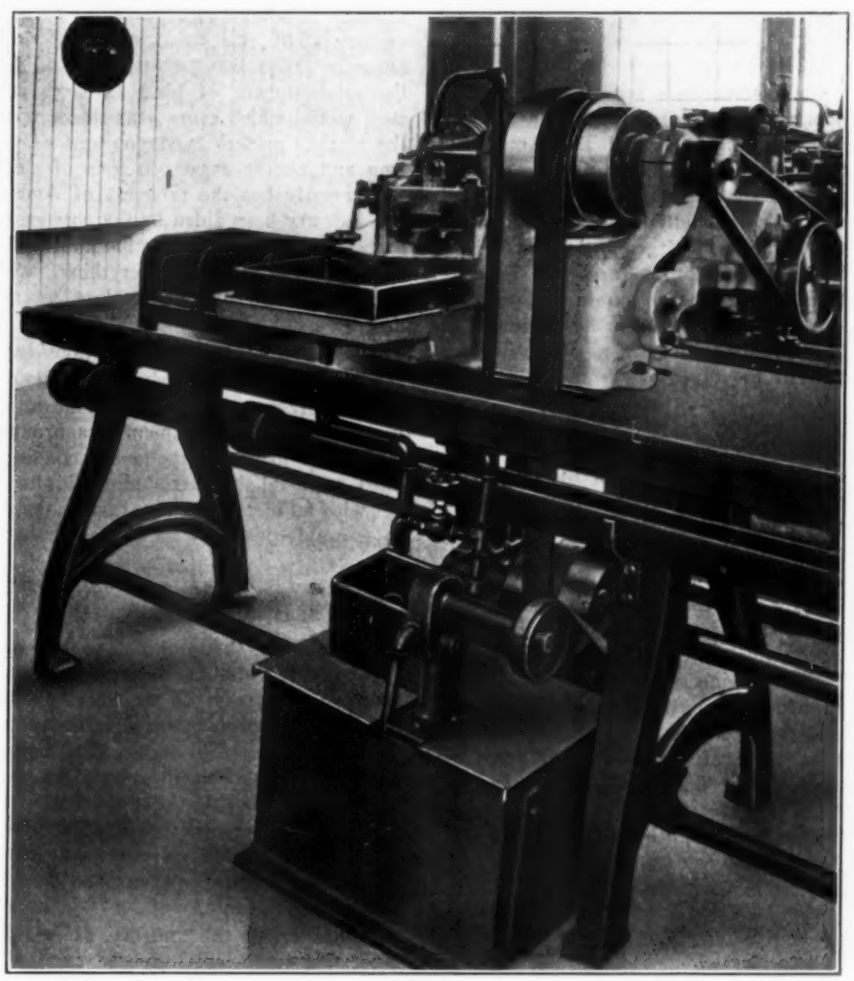


FIG. 5. OIL PUMP AND TANK ON SINGLE MACHINE FOR TESTING OILS AND LUBRICANTS

None of the oil from the entire oiling system is seen on the benches or floor, as the drainage from each machine is perfect, and the work is left in the boxes, shown in the front of the machines to the right of Fig. 2, until the oil is entirely drained off from them. The cuttings or chips from each machine are also taken care of in individual boxes so that the entire room with its bright looking operators, white walls and ceiling, white machines, clean benches and floors, absence of belts and noiselessness, presents a very pleasant appearance.

One of the policies of the Standard Tool Company is to make the surroundings for its employees as pleasant and agreeable as possible, so as to be able to get a self-respecting and intelligent class of workers in its employ and thus be able to turn out a high class of work.

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The forestry operations of the Pennsylvania railroad are assuming notable proportions according to the *Engineering News*. This spring 625,000 young trees were stocked in the nurseries or planted permanently, bringing the number of trees set out by the company to a total of 2,425,000—the largest amount of forestry work undertaken by any corporation in the United States.

# The Recently Proposed French Tariff

## The Suggestions Reported By the Commission of French Manufacturers of Machine and Small Tools Asking for Higher Duties

## SPECIAL TRANSLATION*

### Report of the Committee of French Manufacturers of Machine and Small Tools

*First. Necessity of protecting the machine-tool industry in France.*

Since the elaboration of the customs tariff of 1892, the manufacture of machine tools has come to occupy first rank in importance among mechanical industries, and it has passed, through the almost total absence of protection, to the last rank in the customs tariff.

Its existence was revealed to the great public by the automobile industry. At the first Exposition of the Automobile Club the machine tool timidly took its place in the basement of the Grand Palace; today it boldly invades the Esplanade des Invalides, and grouped about it in an historical exhibition are the ancestral types of the modern automobile, to which it seems to say, "Look, how without me you would have remained in the imagination of the inventors."

### Invasion of Foreign Machine Tools

This spectacle is not made to exalt our national pride. While, at the Grand Palace of the Automobile, French machine-tool industry triumphed, at the Invalides one is hardly able to find it, scattered as it is among numerous foreign competitors.

Why does it occupy such a small place there, although it employs in France 15,000 workmen?

Our engineers have given sufficient proof of their ingenuity, their methods and their science in automobile construction, so that one cannot doubt their capacity to build machine tools. Our workmen are no less skilful in this second industry than in the first; it is, therefore, necessary to look somewhere else for an explanation of this inequality.

### Perfection of American Methods

The development of an industry depends almost exclusively upon the conditions of its medium. The American manufacturers, and after them the German builders, have given proof of the truth of this axiom. They have found in their own country economic conditions most favorable to the progress of the machine tool, and it is therefore that they have outstripped the French builders so far as to hold them for certain classes of machines completely dependent.

It is in America that this industry has reached a point nearest to perfection, because there, more than anywhere else, exists the economic necessity of substituting machine work for hand work, the price of which is very high. It is also in that country that an almost inexhaustible market has stimulated the efforts of manufacturers.

One can easily conceive the formidable equipment of tools necessary for the construction and operation of a system of railways of 400,000 kilometers, for the development of coal fields which produce annually 375,000,000 tons of coal and for the establishment of blast furnaces and steel works which every year throw upon the world's market 25,000,000 tons of pig iron and almost 25,000,000 tons of steel. And greatly has the progress of American industry been aided by the absence of a past, by ignorance of routine and by the necessity of creating everything, with nothing to modify, to replace or to destroy.

The superior economic conditions have created a domestic market with almost indefinite power of absorption; the intervention of the Government has brought about an artificial economic condition most powerful, by surrounding this market with an insurmountable barrier, thanks to a prohibitive duty of 45 per cent. *ad valorem.*

### The Progress in Germany

In Germany the progress of the machine-tool industry has been favored only by the development of the home market due to the sudden expansion of the metallurgical industry. In fact, within twenty years the establishment of an immense system of railways, the construction of a formidable fleet, the exploitation of inexhaustible supplies of coal and metal, have given rise to an enormous demand for tool equipment.

In France, on the contrary, as in England, this equipment has been created in the course of long years, keeping abreast with the progressive development of needs. Thus Germany has been able, without very effective tariff protection, to develop its machine-tool industry. Its situation will, however, undergo a profound change. That nation has been unable to free itself from the foreign industry, and particularly for small machines required in ordinary operations. In 1902, at the time of the formulation of the new customs tariff, which has been in force since May, 1906, it had need to protect itself only in regard to those machines which it felt constituted a menace, and thus were quadrupled the duties on machines of less than 250 kilos, by raising them from three to twelve marks.

### The Success of America and Germany

These, then, are two rivals who have found in their national market economic conditions essential to the progress of the machine-tool industry. They have been able, simply by the resources of their home market, to acquire the weapons necessary to undertake and complete the conquest of the world's market, and it is in France that they have particularly succeeded.

In the first place, because they have come at a time when we have the greatest need of equipment in the automobile industry; in the second place, because the existing duties do not afford us, as we shall soon perceive, any protection whatever. The invasion of the French market by foreign machine tools is revealed in an examination of the tariff statistics.

In 1897 the imports of foreign machine tools were 5½ million francs. In 1907 they exceeded 31 million francs, and since the mean specific value established by the commission of tariff values is much inferior to the *real specific value* of the machines imported, this figure of 31 million francs does not represent the exact value of the machines purchased abroad. If, further, we take account of the fact that a great number of machine tools are imported into France as detached pieces of machines or as pieces of transmission, we believe we shall not be far from the truth when, taking into consideration the increase of business of foreign exporting houses, we estimate that our imports of foreign machine tools have been in the last few years somewhere about 50,000,000 of francs.

### Causes of the Importations

Let us now examine the new economic facts that have caused the imports. They are of three kinds, scientific, exterior, social.

The tariff classification now existing, and which was in 1892 only a reproduction of earlier nomenclature found in the preceding tariff, places machine tools in three classes—*small and precision; medium; large.*

Perhaps at one time *precision* was an exclusive quality of small machines, but today every machine tool ought to be precise, and it would be inexact to believe that only the small machines have a great specific value. We should even note the anomaly that in France, especially in the northern part, are manufactured a great

*From *L'Usine*, Paris, translated by E. P. Buffet.

many small machine tools intended for rough trades, and which are for the most part exported to all the markets of the world.

### The Two Classes of Machine Tools

If the conditions by which the customs tariff is applied permitted it, we should range machine tools in two great classes: One class, machines of general construction and use, capable of performing various operations; the other, machines for manufacture by repetition, performing definitely determined operations.

The first are already manufactured in France. For the second we are almost entirely dependent on the foreigners and that is because there are not found in our home market economic conditions indispensable to their manufacture. In the evolution of our industry we notice the growing use of special machines arranged for repetition work. This specialization is nothing else than the application to machine tools of the principle of division of labor. But the manufacture of these machines requires the use of a costly tool equipment, ties up a considerable amount of capital and is only feasible when a great many articles of the same sort are required.

The specific value of these machines is such that with the existing tariff duties the protection, as we are about to demonstrate, is nothing; and without certainty of possessing and holding our home market, already limited, and occupied by foreigners, no manufacturer would have the temerity to specialize and to create the costly tool equipment necessary for this manufacture.

A single company of recent formation and strongly capitalized has been able to realize the special commercial conditions which may warrant its enterprise.

### Conditions Are Changed

The progress of mechanics in its application to machine tools has therefore totally changed the conditions of this industry.

We have noticed the rupture of equilibrium between the protection given to French machine tools and that obtained by foreign builders for their machines, since in the United States the protective rate is 45 per cent. *ad valorem* and in Germany a recent tariff has quadrupled the duties upon the only machines for which that country remains dependent on us.

Finally, we should not omit to examine some facts of the social order, relating to the reforms in conditions of labor enacted by our domestic legislation, which have neutralized the effect of the protective duty.

### Increased Cost of Production

We do not attach to this last consideration an extreme importance, for foreign industry will find itself, sooner or later, subject to the same costs, which are the inevitable results of all social progress. It is nevertheless true that the accident law has raised our manual labor about 4 per cent.; that apprenticeship has been subjected to hindrances by legislation whose object, indeed, was only to protect childhood; that we must recognize the charges that will result from the application of the approaching law as to workmen's retreats; and one cannot accuse us of exaggerated foresight in taking account henceforth of the eight-hour day, which will result in a new increase in the cost of manual labor. On these points we are not discussing the question of State intervention. We accept the new charges that it imposes upon us, but we claim also its intervention for the safeguard of our national market.

What are the difficulties possible to this intervention? Let us examine the classes of individuals that this protective measure interests. It concerns the producers, the middle men, the consumers. If the machine-tool industry be not protected the present builders will not undertake the manufacture of those improved machines specially designed for repetition work and for which we now are tributary to the foreigner.

The middle men hold an interesting place in the commerce of the nation, but the measure that we propose cannot harm their interests, since they will be able to find in distribution to consumers of machines built in France a remuneration identical with that gained by the distribution to French consumers of foreign machines.

Assume even that our hypothesis be false, can we place in the balance the interests of these middle men against those of the thousands of French workmen whom the importation of 50 million francs of foreign machine tools deprives of 30 million francs of their wages?

### Possibility of Lower Prices

We have still to think of the consumers who fear an advance in the cost of equipment. This fear is unjustified, since the increase of the means of production without this protective tariff will doubtless rapidly exceed the needs of the home market, and before this industry has been able to win a place in foreign markets already occupied, the necessities of competition will oblige our manufacturers to lower their price for their own market.

These manufacturers will, in fact, be able to reduce their selling prices more easily from the fact that they will be able to realize by their specialization and their processes of manufacture in large quantities, important reductions in their cost of production.

To sum up: The machine-tool industry has reached the greatest perfection in the countries where it is most protected. Its evolution toward automaticity and specialization requires the use of costly processes of manufacture. In our national industry it plays a role so preponderant that all progress depends upon it; it enters into all our schools; it has become the principal element of our national defense; it will be the most powerful instrument of our expansion in the world.

We hope, then, that the public authorities will take account of these manifold considerations and accord to the machine-tool industry the protection indispensable to its life and its development.

### Tariff Schedules Asked for Machine Tools

Before examining the duties we ask to be applied to machine tools, it is important to rid ourselves of the idea that governed the enactment of the existing tariff—to wit, that only small machines are machines of precision, and that, in consequence, only these machines have a great specific value.

Every modern machine tool, with the exception of certain machines employed in the large forges, has, for a primary characteristic, *precision;* and, if the specific value of the light machines has increased with the progress of mechanics, that of machines above 1000 kilograms has increased in yet larger proportion.

On this page is given a table of the specific values of three classes of foreign machines, recently imported, for his own use, by a French manufacturer of machine tools.

The mean specific value of these machines of over 1000 kilos exceeds three francs per kilo.*

To avoid all arbitrary measurement, the group of French Machine Tool Builders, forming part of the Syndicate of Machinists, Boilermakers and Founders of France, has laid down, in a carefully prepared comparative table, which follows on the next page, the specific value of machine tools made in France.

| Designation. | Weight. | Price. | Specific Value per Kilo. | Duty Paid. | Ratio Duty to Value of the Machines. |
|---|---|---|---|---|---|
| | Kilo. | Franc. | Franc. | Franc. | |
| Turret lathe | 1545 | 3.770 | 2.4 | 154.50 | 4.0 p. c. |
| Gear cutters | 4175 | 14,500 | 3.4 | 417.80 | 2.8 |
| | 1735 | 7,030 | 4.0 | 173.50 | 2.4 |
| Straightening machine | 970 | 5,410 | 5.5 | 155.20 | 3.0 |

*Divide francs per kilo. by 10 and we have dollars per pound. This rule is so simple that it instantly converts the values given in the article into their American equivalents with sufficient accuracy for mental appreciation. The duties appear generally to be stated in francs per 100 kilos.

| | Franc. |
|---|---|
| Machines over 5000 kilos | 1.50 |
| Machines 1000 to 5000 kilos | 2.00 |
| Machines 250 to 1000 kilos | 2.50 |
| Machines 100 to 250 kilos | 3.00 |
| Machines of less than 100 kilos | 4.00 |

By the tariff in force, a machine of 1000 kilos worth 2000 francs, pays only 100 francs duty; the protective rate is only 5 per cent.

The existing imposts are, therefore, absolutely insufficient, and we ask that the following duties be applied:

| | Minimum Tariff. | General Tariff. |
|---|---|---|
| Machines of more than 5000 kilos, franc | 30 | 40 |
| Machines 1000 to 5000 kilos, franc | 40 | 50 |
| Machines 250 to 1000 kilos, franc | 50 | 60 |
| Machines 100 to 250 kilos, franc | 60 | 80 |
| Machines less than 100 kilos, franc | 80 | 100 |

which is equivalent to an *ad valorem* protection of 20 per cent.

### Proposal Not as Extreme as it Seems

This protective tariff may seem excessive, but it is necessary not to forget that our specific values are only *mean* ones, and that in the majority of cases, as results from the first table given above, the specific value of the machines of more than 1000 kilos, actually imported, is above 3 francs per kilo.

The duties are equivalent, for these machines, to a protection of 13 per cent. *ad valorem*.

The figures that we indicate for the duties that we ask as general tariff are those of minimum tariff increased 25 to 33 per cent.

The application of customs duties to machine tools presents great practical difficulties, and to demonstrate well the necessity of the modifications that we desire to see introduced in the new customs tariff, we shall proceed to study the operation of the present customs system, so far as it concerns the machine-tool industry.

Machine tools are subject to the rates of article 525, indicating:

**For machines over 1000 kilos, 10 francs, as minimum tariff.**
**For machines from 250 to 1000 kilos, 16 francs, as minimum tariff.**
**For machines of less than 250 kilos, 50 francs, as minimum tariff.**

We should infer from this table that all machine tools weighing less than 250 kilos ought to pay a duty of 50 francs per 100 kilos, that is, at most 125 francs by the minimum tariff. Now see how these matters work out in practice:

The importer has two ways to avoid paying these 125 francs duty. In the first place, he may import the machine incomplete, taking pains to remove some essential part without which it will not work.

This machine is then considered as "detached pieces of two or more metals," rated by article 535 *bis*, and pays: Pieces of 50 to 300 kilos, 20 francs per 100 kilos, that is, 50 francs.

### Combination Rates

The second process that the importer may employ to avoid paying duty of 50 francs per 100 kilos consists in dismounting the machine and bringing it in as "detached pieces made of cast iron" (article 532); as "parts of transmitting machinery, general mechanics" (article 525, *bis*), and as "pieces made of iron or steel" (article 533).

If we assume for this machine of 250 kilograms total weight, 180 kilograms of cast parts, 40 kilograms of parts of transmissions, 30 kilograms of pieces of iron or steel, we arrive at the payment of the following duties:

Article 532—180 kilograms of cast parts of less than 200 kilogarms, at 20 francs per 100 kilograms, 36 francs. Article 525 *bis*—40 kilograms of cones, gears, parts of transmissions, at 10 francs per 100 kilograms, 4 francs. Article 533—30 kilograms of pieces of iron or steel, at 25 francs per 100 kilograms, 7.50 francs; total, 47.50 francs.

In the first case, 50 francs, and in the second case, 47.50 francs of duty are actually paid, although the French manufacturer believes himself to be protected by a total duty of 125 francs.

There are then, at present, three ways of importing machine tools:

1. Complete.
2. Incomplete.
3. In detached pieces.

According to the existing tariff applicable to machine tools, there is no advantage in employing the two latter methods except for machines of the first class, weighing less than 250 kilograms. The importer has no interest in entering as "detached parts" machines of more than 250 kilograms, because those of 250 to 1000 kilograms pay only 16 francs, and those of 1000 kilograms only 10 francs. Yet it is worthy of remark that in certain cases, importers of foreign machines introduce into France parts of machine tools belonging to machines of 250 to 1000 kilograms, which ought to pay 16 francs, and for which they pay only 10 francs per 100 kilograms by declaring them "parts of transmissions."

### Preventing Too Low Duties

We find ourselves, therefore, under the necessity of specifying precisely what is meant by transmissions, which are now provided for in the article on "General Mechanics," No. 525 *bis*, of the tariff. We annex to this report, notes explanatory of the table of duties concerning article, 525 *bis* of the "General Mechanics," and particularly of the "Transmissions." It will here be seen that almost any part of a machine tool may be appraised as "Transmissions."

We ask that the "Transmissions" be taken out of article 525 *bis* of "General Mechanics" and made to form an article apart. We ask beside that the term "Transmission" be not extended by a false use of the word to constituent organs of a machine.

### What Constitutes Transmissions

*Let "transmissions" be the organs transmitting the motion of the motive power to the machine tools, and generally constituted: By brackets and boxes forming supports; by shafts and couplings; by pulleys and cones.*

This exact definition of the word transmissions could be written in the commentaries or notes explaining the table of duties, and the present fraud, which consists in making the constituent parts of a machine pass as organs of transmission would be suppressed.

### One of the Tricks

We further ask that the transmissions, or intermediate connections of machine tools be no longer considered as making an integral part of the machines. Today the importer of foreign machine tools takes pains, when a machine weighs, for example, 90 kilograms, to add to it a transmission, or intermediate connection weighing, for example, 110 kilograms, which gives a total weight of 1010 kilograms and brings the machine into the class paying 10 francs duty instead of 16 francs, which it ought to pay.

The practical difficulty of application of the duties concerning transmissions could be resolved by the adoption of the following clause:

"Article 525 ter.—*Organs of transmissions other than those forming a constituent part of a machine; general tariff, 30 francs; minimum tariff, 20 francs.*"

The mean specific value of the transmissions being 1 franc per kilogram, the draft of article 525 *ter* should be completed by the following note:

"*The organs of transmission forming a constituent part of a machine are considered as detached parts of machinery.*"

### How it Will Work

It remains to us to consider the question of the practical application of the tariff concerning detached parts of machine tools. If we assume, for complete machine tools, that there were a tariff such as we have asked for above, the importers of foreign tools would have even more interest than today in dismounting the machines and introducing them as "detached parts." It is necessary, in order to suppress this fraud, to adopt the following tariff rule: That "the heaviest detached parts shall be appraised according to the rate on the lighest machine tools." The application of this rule would bring us to tariffs absolutely prohibitive, and since detached parts are not exclusive to machine tools, a practical difficulty would present itself: that of distinguishing the parts of machine tools from those of other machines.

We think we have settled this difficulty by drafting article 525 concerning machine tools as follows: "*Machine tools, complete or incomplete, and groups of detached parts of machine tools.*"

This article would be accompanied by an explanatory note, as follows: . . . .

*"The groups of detached parts of machines for which is claimed another classification than No. 525, should be accompanied by a drawing of the machine, with an indication of the position of the parts in the said group."*

### The Tool Equipment

There remains to us to study a last practical difficulty of the tariff. At present the Tariff Administration is confronted with the following problem when small tools are imported at the same time as a machine tool:

Are such tools "an integral part of the machine" or are they "detached parts of a machine" or are they "(small) tools" classified in article 537?

We ask that, by an explanatory note to the table of duties, it be laid down that a machine tool *"is essentially constituted by a frame and organs which concur in the production of movements; as an exception, there is considered to form part of the machine tool the tools that are imported fixed upon the apparatus."* The sets of interchangeable tools would not be admitted as forming part of the machine and would come under article 537 treating of small tools.

Finally the present article 525 *bis* on "General Mechanics," containing this draft:

"Unnamed apparatus driven by a mechanical motor," should have, we think proper to ask, notes explanatory of the table of duties, giving the definition and exact nomenclature of the different machine tools. The note that follows hereafter gives the list of metal-working machines with which we are especially concernod.

We have not, in this study, followed an academic object. We have not proposed the question whether "free-trade" or "protection" is the true or false doctrine. We have only examined the measures that seem to us to be most efficacious for assuring the prosperity and development of our industry.

We think that we shall not be reproached with having exaggerated our case, since, for several classes of machines, the mean rate, which is as high as 20 per cent., gives in reality only an *ad valorem* protection of 13 per cent. We should dispense with a detailed answer to this objection if it were made to us, and we should content ourselves with recalling that the present duty on the importation into France of sheet iron is 5 francs per 100 kilograms and that 100 kilograms of sheet iron have actually a market value less than 15 francs; the protection amounts to 33 per cent. of the total value. It is necessary to add that the proportion of hand work in the price of sheet iron is infinitely less than that in the price of a machine tool, of which the proportion of manual labor sometimes reaches four-fifths of the total value of the product.

| Numbers. | Present Tariff. | Duties. General Tariff. | Duties. Minimum Tariff. | Numbers. | Tariff Demanded. | Duties. General Tariff. | Duties. Minimum Tariff. | Specific Value Per Kilogram. | Observations. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Francs | |
| 525 | Large machine tools: 1000 kilos. and over | 15 | 10 | 525 | Machine tools complete or incomplete and groups of detached parts of machine tools: | | | | |
| | Medium machine tools: 250 to 1000 kilos. | 20 | 16 | | Of 5000 kilos. and over | 40 | 30 | 1.50 | |
| | Small and precision machine tools: | | | | Of 1000 to 5000 kilos. | 50 | 40 | 2.00 | |
| | 250 kilos. and less | 70 | 50 | | Of 250 to 1000 kilos. | 60 | 50 | 2.50 | |
| | | | | | Of 100 to 250 kilos. | 80 | 60 | 3.00 | |
| 525 *bis* | General mechanics: | | | | Of 100 kilos. and less | 100 | 80 | 4.00 | |
| | Transmissions, balances, scales, fixed railway material, signals, presses, hoisting apparatus, unspecified apparatus driven by a mechanical motor | 15 | 10 | 525 *bis* | General mechanics, excluding: 1st, transmissions; 2d, hoisting apparatus such as tackles, hoists, screw-jacks, rack-jacks. | | | | To be fixed. |
| | | | | 525 *ter* | Organs of transmissions other than those forming a constituent part of a machine | 30 | 20 | 1.00 | |

EXPLANATORY NOTES: Art. 525.—The groups of detached parts of machines for which there is claimed another classification than No. 525, should be accompanied by a drawing of the machine, with indication of the positions of the parts of the said group.

*Article 525 ter.*—The organs of transmission forming constituent parts of a machine are considered as groups of detached parts of machinery.

MACHINE TOOLS—ARTICLE 525.

### Machine Tools

The name "machine tools" designates apparatus that permits the mechanical functioning of tools or instruments for the purpose of fashioning metals, wood, leather, stone, etc.

Machine tools may be apportioned to three classes, according to the nature of the materials that they are intended to work, viz:

1. Machines for working metals and metal products.

2. Machines for working wood and wooden objects.

3. Machines for working stone and other materials.

The most extensively used machines of the first class are the following:

Presses for punching and cutting, for striking off coins and medallions and for stamping; embossing machines, etc.; draw benches, shears, punching machines, shapers, rolls, *grinders* (lapidaires) *for dressing and polishing.*

Machines for sharpening tools, drills, cutters, etc.; for sharpening the teeth of cards, for boring, brazing, *fluting* (or channeling), *centering*, beveling, . . . bending, . . . dressing, embossing, stamping, drawing, shaping weavers' reeds; forming and working textile rollers; making spangles, pins, nails, brads, wire gauze, *screws*, type, etc.; threading, drilling, milling, stamping letters, designs, etc.; forging and dressing nuts; engraving, engine-turning (i.e., tracing curves), filing, grinding, slotting, coiling springs, piercing, punching, molding (or forming) cast pieces, planing, grooving, *straightening*, upsetting, *reproducing*, riveting, polishing, sawing, soldering; cutting metals, gears, etc.; tapping; turning axles, guns, etc.; working sheet metal (smoothing, forming, cutting out, bending, rolling, edging, etc.); wire-drawing; cutting, truing, rounding and rolling cuts and galvanotypes, etc.; tappet hammers; hydraulic and steam hammers, mechanical hammers; rams for forging and stamping; presses for drawing, cutting, stamping, etc.; tables for polishing needles; lathes of all systems (hand, engine, turret, vertical, etc.).

The table given herewith sums up our requirements.

### Second—Tariff Asked for Machinists' (Small) Tools

We have demonstrated that the adjustment of duties on machinery no longer corresponds to the actual situation of that industry. Our tariff, in article 537, which regulates small tools, seems to us even more antiquated by reason of its designation "tools with handles or not."

This class makes no distinction between the stonecutter's chisel or the woodcutter's bill-hook, which doubtless are worth less than 1 franc per kilogram, and the cutter with mathematical profile, the price of which attains 80 francs per kilogram.

The progress of modern mechanical industry absolutely requires a special classification of machinists' tools. They are now subject (No. 537) to the following tariff:

| | General Tariff, Francs. | Minimum Tariff, Francs. |
|---|---|---|
| Entirely of iron | 18 | 12 |
| Of steel or of iron set with steel | 27 | 22 |
| Of copper | 35 | 30 |

The tools with which we are concerned now pay 22 francs per 100 kilograms, at the minimum tariff. Since numerous classes of tools have a specific value of 25 francs per kilogram, we see that the present tariff

does not give to this industry a protection *ad valorem* of 1 per cent.

The diversity of machinists' tools obliges us to demand a *fundamental modification* of the customs tariff for these articles.

### The German Solution

The German legislature has solved the difficulty in the adjustment of the last tariff, in force since May, 1906. It has attempted to follow the life of a mechanical piece in a shop and, classing the various machines or tools employed in the works, it has established a classification which is reasonable and perfectly clear and which admirably responds to the present needs of this industry.

In a first class it has placed the tools or appliances that serve to bring the work within reach of the machine or workman. There are hoisting apparatus, such as tackles, hoists, screw jacks or rack jacks (article 807 of the new German tariff).

We therefore ask that tackles, hoists, screw jacks, rack jacks and similar appliances be excluded from article 525 *bis*, "General Mechanics," and form the subject of a special number, "537 A," in the chapter on small tools, which shall comprise the following schedule:

| | Minimum Tariff. |
|---|---|
| 100 kilos. and over | 30 francs. |
| 15 to 100 kilos | 40 francs. |
| 5 to 15 kilos | 45 francs. |
| 5 kilos. and under | 50 francs. |

After treating the tools that had served to carry the piece of work to its position in the works, the German legislature took up the question of tools used for fixing this piece, for which purpose are used the vises and appliances named in No. 806 of the German tariff.

At present vises pay 22 francs by the minimum French tariff. This protection is more than sufficient for adjustable vises properly so-called; but no difference is made between this vise, the specific value of which is about 1 franc per kilogram, and the small bench or hand vise whose price varies from 3 to 5 francs per kilogram.

We therefore demand the creation of a classification for this category of tools, article 537 B, with duties as follows:

| | Minimum Tariff. |
|---|---|
| 15 kilos. and over | 20 francs. |
| 5 to 15 kilos | 40 francs. |
| 3 to 5 kilos | 60 francs. |
| 3 kilos. and under | 80 francs. |

for the specific values of 1, 2, 3 and 4 francs per kilogram, which are also set forth in the final summary.

In order not to multiply special names we ask that, in this class, be included not only the tools which serve to hold the piece of work, such as vises, but also the appliances which hold the tool that performs the work, such as screw plates or tap wrenches; the ratchet drills, braces and breast drills, which hold the drill during drilling, and, by assimilation, wrenches of all sorts, "star" wrenches, monkey wrenches, etc., etc., used to tighten the nuts or other parts of the machinery during the work.

After carrying the piece of work with the appliances stated in article 537 A, and clamping it on the fixtures provided for in article 537 B, we arrive at the work, properly speaking, upon this piece.

The operations are manifold. One has occasion to saw with tools designated under the head 811 of the present German tariff; he has to file with the tools designated in article 812 of the German tariff; he has to drill, tap, mill, plane, cut off with the tools designated under No. 813 of the same tariff.

### Another Class Formed

We now shall have to form a third class of tools (No. 537 C), which, according to their specific value, should fall into several divisions. We shall, in this study, pay no attention to saws and plates, circular and band saws, hand saws, of article 811, German tariff, nor to files and rasps of article 812 of the same tariff. We shall disregard all but tools of fine steel of a sort with those designated in article 813, present German tariff, and which we shall define as follows:

"Article 537 C—*Tools of fine steel, drills, reamers, taps, dies for screw plates, cutters, punches and dies, shear blades.*

The specific value of cutters varies from 12 to 20 francs per kilogram. That of taps varies from 8 to 20 francs. The mean value of drills is 12 francs per kilogram. If we take as *mean* specific value 12.50 francs, we shall then ask a duty of 250 francs at the minimum rate to obtain a *mean* protection of 20 per cent. *ad valorem*. The present protection of 22 centimes per kilogram is not as high as 2 per cent.

### The Qualities of Steel

If, in tariff practice, the distinction between qualities of steel presented no difficulties, we should ask that these same tools of class 537 C, when they are made of so-called "high-speed" steel of tungsten, molybdenum, wolfram, air-hardening, be assessed with a double duty, say, 500 francs per 100 kilograms.

It would be *very advantageous* if this distinction could be carried out practically for the evolution of the tool industry enables us now to perceive that in the near future tools of this class will be manufactured of so-called "high-speed" steel. But this steel in plate form costs at present 6 francs per kilogram, and the tools made of it have a *mean* specific value exceeding 25 francs per kilogram.

### Another German Example

After the example of the German legislature we are constantly following the piece of work in its transformations. We have seen it brought to the workman, or to the machine that is to deal with it. We have seen it fixed to be worked, and finally, we have assisted in working it. Next in order is to test it, for which purpose are used the instruments designated in article 814 of the German tariff.

We wish to see these tools scheduled under the title:

"537 D—*Instruments of precision, measurement and verification: calipers, 'palmers,' squares, rules, precision compasses, gages, and the like.*

The *mean* specific value of these tools being 25 francs per kilogram, we will demand a rate of 500 francs per 100 kilograms minimum tariff. At present *these tools are exempt, and they are nevertheless the kind of tools whose manufacture ought to be the most protected in France*, for it is by the use of these gages and instruments of precision and by the familiarity of our workmen with processes of mathematical verification that we shall contribute most to the progress of our mechanical industry.

Finally in a fifth class "537 E" we would wish to see placed, unspecified tools, such as hammers, hardies, smiths' chisels (burins), blacksmiths' tools, the *mean* specific value of which is 1.50 francs per kilogram, and for which we would ask, as minimum rate, a duty of 30 francs.

The following sums up what we desire:

No. 537. Tools with handles or not, excluding machinists' tools, to be decided later.

No. 537 *bis*. Machinists' Tools.

A. *Hoisting appliances*, tackles, hoists, screw jacks, rack jacks, 100 kilograms and over, 30 francs; 15 to 100 kilograms, 40 francs; 5 to 15 kilograms, 45 francs; 5 kilograms and less, 50 francs.

B. *Vises of every sort, screw plates, tap wrenches, ratchet drills, braces, breast drills*, "star" wrenches, and other wrenches with wooden handles, monkey wrenches, 15 kilograms and over, 20 francs; 5 to 15 kilograms, 40 francs; 3 to 5 kilograms, 60 francs; 3 and less, 80 francs.

C. *Tools of fine carbon or chrome steel*, drills, reamers, taps, dies of screw plates, punches and dies, shear blades, 250 francs; the same tools of so-called high-speed steel, tungsten, molybdenum, wolfram, air-hardening, 500 francs.

D. *Instruments of precision, measurement and verificitation*, "groove" calipers and others, "palmers," rules, precision compasses, gages and the like, 500 francs.

E. *Unspecified tools*, hammers, hardies, smiths' chisels, blacksmiths' tools, etc., 30 francs.

# The Time Required for Machine Work—IV

## Interesting Examples of Work That Is Being Done on Engine Lathes, Both with and without Turrets on the Tailstock in Record Time

BY FRED H. COLVIN

In the development of the automatic and special machines, both hand operated and automatic, we have in too many cases, largely lost sight of the older machines, such as the engine lathe and it has received scant attention in the way of fixtures or appliances that might improve its output. A number of shops are taking the matter up, however, and the engine lathes are making a splendid showing in many cases, and are turning out more work than was deemed possible a few years ago.

The examples shown in this article are from the shop of the Whitcomb-Blaisdell Company, Worcester, Mass., the fixtures being due to Mr. Wiggin, their superintendent. They give an idea of some of the simple methods and fixtures by which the output can be largely increased under good conditions.

Starting with the shaft-turning attachment shown in Figs. 1 and 2, which is used for turning feed rods and lead screws, we have a holder which spans the lathe and fastens to both wings of the carriage. This carries a cutter head with four circular cutters and one flat cutter between two of the others. The circular cutters are set so that each takes its share of the cut, the last being the finish size. The fifth cutter is also set to the finishing size, but does not cut unless the other finishing cutter slips, or loses its edge, then the fifth or emergency cutter takes up the work to prevent the rod from being left large enough to bind or seize in the bushing. Where a water finish is desired, as on the feed rods, a lathe tool which is ground for this work goes in the tool post behind the holder.

Lead screws vary from 1¼ to 1¾ inches and feet rods from 1⅛ to 1½ inches in diameter, the average reduction in diameter being about 3/16 of an inch. On the lead screws, which do not require the water finish, owing to having the thread cut afterward, the turn from the rough is at the rate of 13 inches per minute, while with the feed rods, finished ready for use except the spline, the rate is 7 inches per minute.

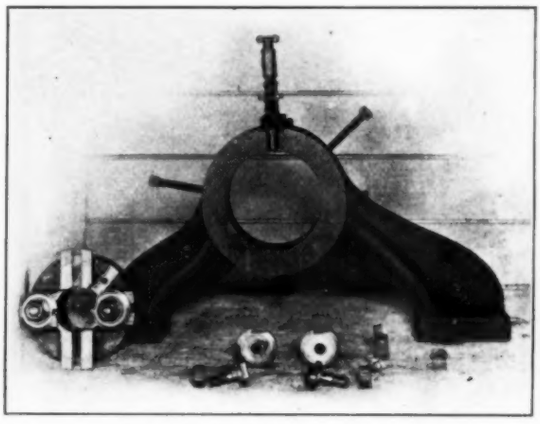


FIG. 1. DETAILS OF FIXTURE USED

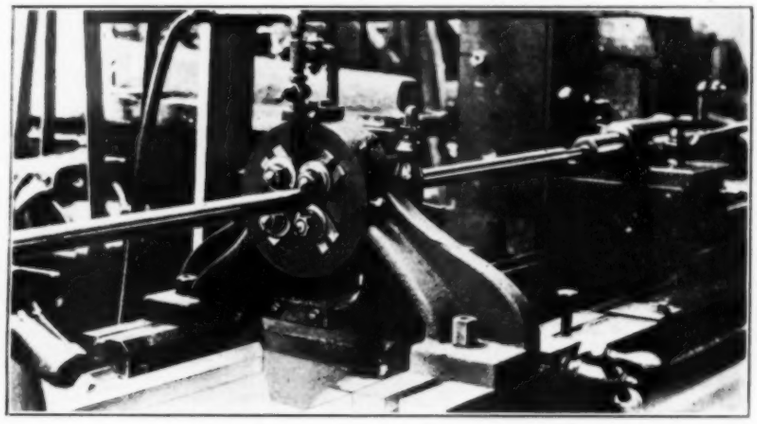


FIG. 2. THE FIXTURE IN USE TURNING SHAFTING

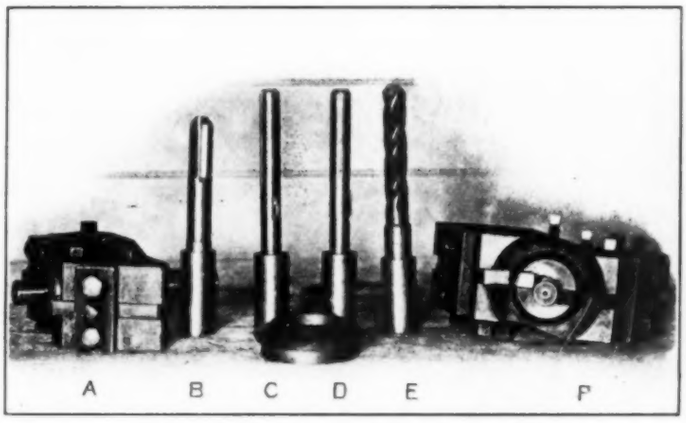



FIG. 3. TOOLS USED FOR BEVEL-GEAR BLANKS

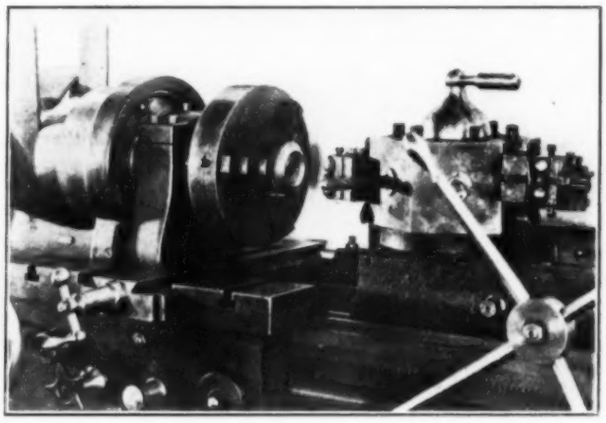


FIG. 4. TURNING THE BLANKS

### Bevel Gear Blanks

The bevel gear blanks shown are 5½ inches in diameter and show the work of the engine lathe equipped with a turret in place of the usual tailstock. This, of course, takes it out of the plain engine-lathe class, but it is a modification that can be made at a comparatively low cost and is evidently more than justified by the results obtained.

Figs. 3 and 4 show the tools used on two sizes of gear blanks. The gear blank is first chucked, then rough bored with a flat cutter held in bar *D*, the front end of the bar being guided in a hardened-steel bushing in the lathe spindle, which gives a hole that is not far from true. Then the three-lip cored drill *E* is used, followed by the sizing flat cutter *C* and the reamer *B*.

The roughing and finishing forming tools *A* and *F* are next used, being guided by the hardened-steel plug in the holder. This has taken about three minutes so far. Then the blanks are taken to a keyseater, splined and slipped on a splined arbor in

the lathe spindle with the beveled face against a true face plate. Two forming tools, similar to *A* and *F*, rough and finish the hub of the gear blank and the job is done with a total time of eight minutes each for all operations, including splining, in fair sized lots. The allowance for error is 0.001 inch.

### Spur Gear Blanks

These and the next job are plain engine-lathe work with only a few slight expenses for fixtures. The spur gears are intermediates for the change-gear tram and are 9½ inches in diameter by 1⅛-inch face. Figs. 5 and 6 show this operation and the fixtures required. First the face plate, with six series of holes, tapped in radial lines for locating the driving studs shown beneath. These are made with a cone head, the cone being at the right distance from the face plate to catch the arms of the gear blank and not only drive them, but hold them against the face plate. Then the centering arbor with a keyway for locating the gear blank, completes the outfit.

The first operation is to chuck, bore and ream the same as with the other gear blanks, also square the hub. They are then slipped over the spindle arbor and driven by three cone-head bolts, as shown in Fig. 6. The face plate is recessed so the turning tool can turn over the whole rim, the rim is faced and then turned over to be faced on the other side. The total time on these gears was 14 minutes each, and the limit of accuracy 0.003 inch.

### Facing Feed Plates

After the boring operation, which is always done first and in the manner described for the bevel-gear blanks, the only fixture needed is the expanding arbor shown in Fig. 7. This fits the taper of the lathe spindle and the long portion is made a nice sliding fit to the limb of the feed-gear plate. The front end is turned smaller for the expanding bushing shown at *B*. The stud *C* slips through the bushing with the square head this way and the pin *E* holds the collar *D* in place so that the expanding bushing is moved in and out on the tapered end of the arbor and in this way centers the outer end of the work perfectly so that the tail center can be used to insure steadiness under a heavy cut. The driving is done by a face-plate stud near the outer end of the handle and in this way the outer diameter of the long hub is turned and the back of the plate faced off with the power feed. The tool marks show the feed that is taken. Both the roughing and finishing cuts are four to the inch. The hub is 4½ inches long by 2¼ inches outside diameter, while the hole is 1¼ inches in diameter. The plate is ⅞ inch thick, making the total length of hole 5⅜ inches. These feed plates are finished all over, the total time for all operations being 50 minutes each.

Gages are used for everything, a set being shown on the tool slide, held together by the brass ring. These gages aid in getting out the work quickly, as if the piece fits the gage, it is right, and no measuring has to be done.

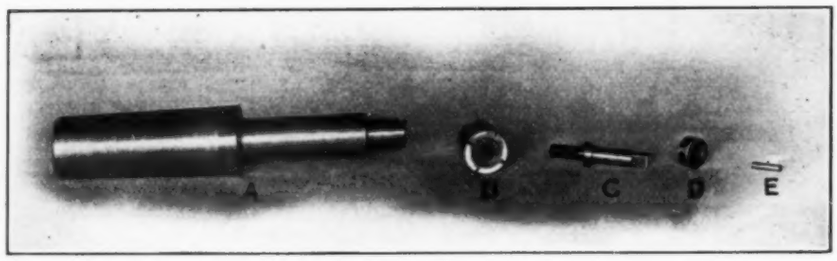



FIG. 7. THE EXPANDING ARBOR IN DETAIL

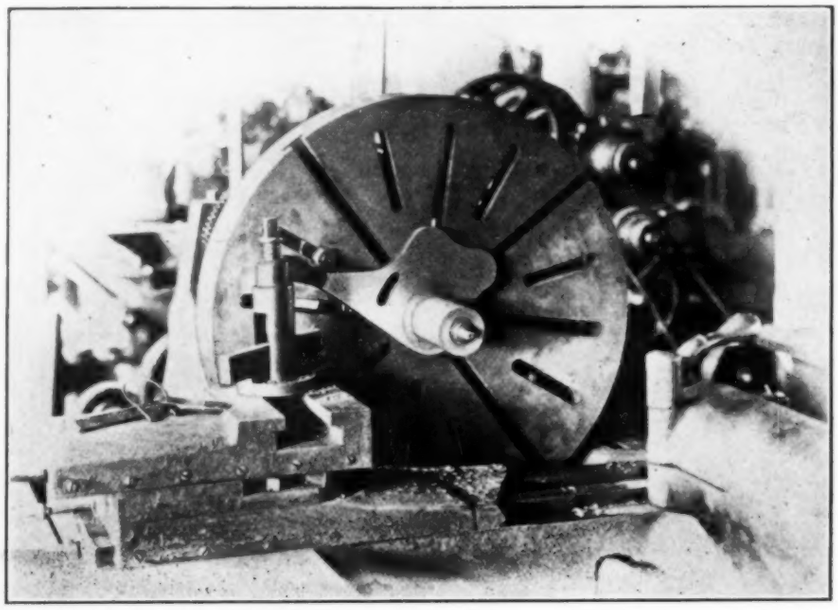


FIG. 8. TURNING THE FEED-GEAR PLATES

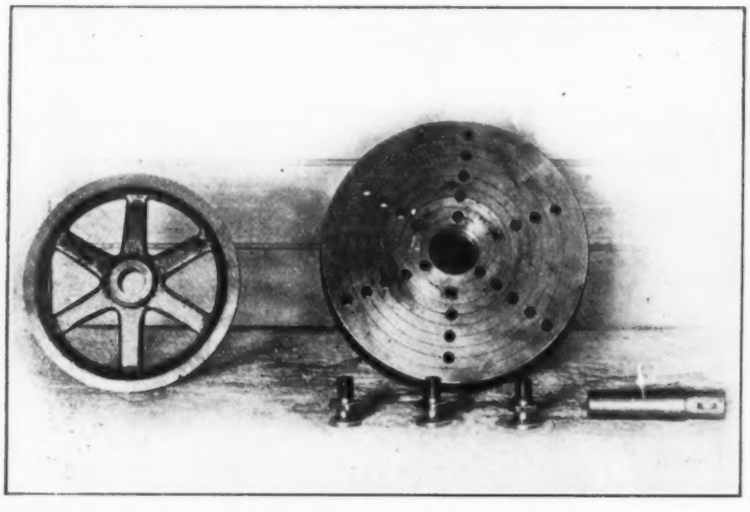


FIG. 5. FIXTURES FOR TURNING SPUR GEARS

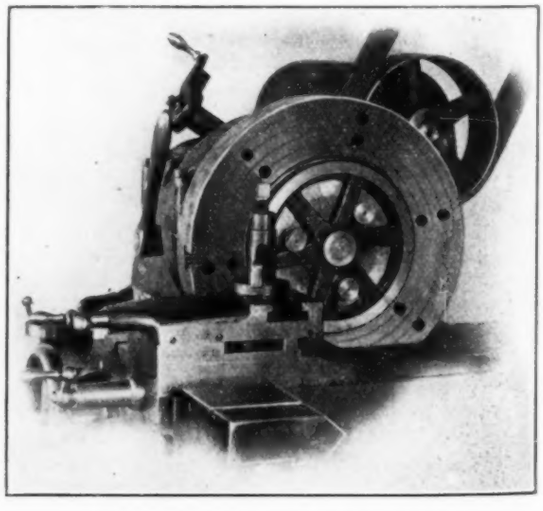


FIG. 6. TURNING SPUR-GEAR BLANKS

# Some Old Gages and Filing Jigs

By E. A. Dixie

"The King is dead, long live the King." That is the way it goes the world over, the useful things of yesterday go to make the scrap heap of today.

I took a run up to Springfield, Mass., the other day to see if any of the old filing jigs were still in existence. These tools were formerly a necessity on all classes of interchangeable work and their use dates back to the time when milling and profiling were not as accurately done as they are now, when emery wheels were unknown, when cutters were kept soft enough to sharpen them with a file when they became dull, when flint-lock muskets were made at the Springfield armory, when gun barrels were smooth in the bore and the bullets were six-tenths of an inch in diameter, just twice what they are now.

With permission from the Chief of Ordnance at Washington and the help of Col. S. E. Blunt, commandant of the armory, and his assistants, I was given a free hand to get what I could. There are quite a number of men at the armory who have been there since before the War of the Rebellion and it was my good fortune to get several of these to help me. The last commandant had caused a great pride ourselves on our marvelous mechanical knowledge may be taken down a peg or two and remove our hats to the handiwork of the old armorers who did good work, work which directly or indirectly helped to assure the unity of the country.

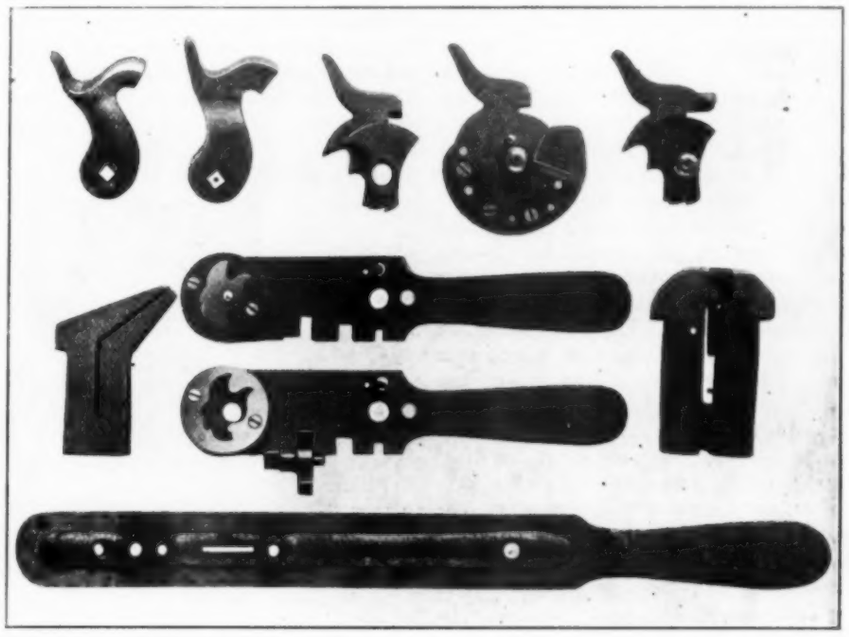


FIG. 2. HAMMERS, FILING JIGS, AND RECEIVER GAGES

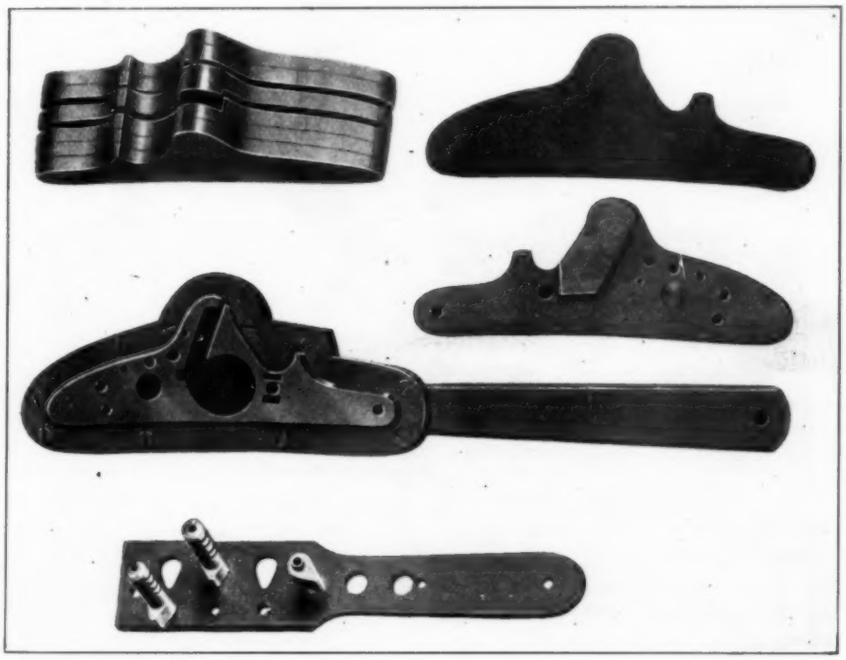


FIG. 1. LOCK PLATES, FILING JIGS AND GAGES

many of the obselete jigs and other tools to be placed in open boxes and laid out so that they could be officially pronounced "dead ones" by the condemning board. As the board had not got around yet I was in time to look over the lot, select a few and get their death masks for the American Machinist so that we who

Unfortunately the jigs and tools were treated as scrap and heaped promiscuously in boxes. Broken milling cutters were piled on what had been fine test gages or models. The sear of a flint-lock musket of the vintage of 1830 was in a lock-plate receiver of 1873. And so on through possibly a hundred boxes, I would find an old piece and not be able to find the jig in which it had been filed. I obtained enough, I think, to show how interchangeable parts were produced in those days.

The only samples of lock-plate, filing jigs and receiver I could find were those used for the Maynard rifle. I am told that the Government paid a royalty of a dollar a piece on these rifles, built and paid royalty on 50,000 of them and then tested them only to find that they were considerably more dangerous to the user than to anyone else. The main principle of the invention is still in use for toy pistols. It consists of a ribbon of paper caps which are coiled up in a little chamber in the lock-plate. A pawl feeds the ribbon up through an aperture just behind the nipple of the rifle. The action of cocking the hammer actuates a pawl which feeds the cap. The hammer is provided with a sharp edge which shears the ribbon in two, between the percussion caps when the sear releases it. The cap thus separated is carried by the hammer to the nipple and exploded, setting the powder charge off. The foregoing is what it is supposed to do. What it actually does is to back fire and set off the ribbon of caps in the magazine. However, the efficiency, or inefficiency of the Maynard rifle does not affect the jigs which were used to produce it.

Fig. 1 at the top left-hand corner shows a lock-plate filing jig with a lock-plate in between the jaws. To the right of it is shown the rough drop forging. The date on the lock-plate is 1855, but some of this type (the Maynard) were made as late as 1858 and possibly later. The filing jig is made of four main pieces. Two outside pieces of machine steel or iron, and

two inner pieces, the correct form, made of hardened tool steel. These hardened pieces were evidently made in quantities with duplicate tapped holes for fastening then to the soft plates and duplicate dowel-pin holes for the two dowels in the soft plate to slip through so that when a jig was worn the hard plates could be easily replaced.

The drop forging of the lock-plate was made with considerably more allowance for finish than is now necessary. In the case shown nearly ⅛ inch in some places and over ⅛ inch in other places has been left for finish on the perimeter and over 1/32 inch has been allowed for finish on the sides. The forgings were, of course, milled, profiled, drilled and tapped, each piece going through the required number of each of the various operations before going to the filers. The piece below the forging shows the inside of a lock-plate after it has been milled to thickness and drilled and tapped, but not profiled. Below this is shown a lock-plate in a receiver. These receivers were of tool steel hardened and were used by the filers to test their work on the perimeter. The receivers were made in the same way as the filing jigs, a soft body with the hardened receiver fastened to it with screws so that when it wore a new one could be fastened to the body.

Below the receiver is a gage on which is stamped "U. S. Swivel punch gauge for Clasp bands Mod. 1861." It is a hardened piece of steel with three hard plugs which fit three sets of holes in the flat piece, each plug having a portion of it lapped to fit one of the holes of each of the three sets of holes. In the half-tone the three plugs are disposed so as to show how they fit the holes. The limits are larger than we would perhaps use nowadays, the difference between adjacent sizes being 0.005 inch, but they are a snug fit for the respective holes and any toolmaker knows the difficulty of making a gage to fit three sizes when one or more of the shapes to be fitted are irregular in contour. Unfortunately very few of the jigs or gages were marked so as to be intelligible to one not conversant with them. I can, therefore, only tell in a general way what they were intended for.

Fig. 2, at the top left-hand corner, shows a musket hammer and alongside it a filing jig, the square hole in the hammer fitting over a square plug in the jig. The small hole above the square plug permits the hammer to be removed with a drift pin. The next piece is a Remington hammer model, of tool steel and next two are inspector's gages or receivers. In the center is an inspector's gage or receiver for a two-notch tumbler. I was told that this style of tumbler was used in the old flint lock and its probable date 1840 or earlier. In the upper half-tone the tumbler is shown in the receiver, in the lower it is shown in the notch which measures its thickness and the length of the shoulder and squared end. The next notch to the right gages the size of the square across the flats, the next the size of the pin at the end and the hole above this notch gages the diameter of the shoulder, while the pin above engages in the principal notch in the tumbler. To the right and left of the tumbler receiver are shown two filing jigs or clamps. They have hinged members and are practically auxiliary vises. The one to the left may be found in any gunsmith's shop and its origin dates back to the days when armor was made.

FIG. 3. VARIOUS FILING JIGS, PARTS AND GAGES

At the bottom in Fig. 2 is shown a receiver with a trigger guard in it. This dates back to 1840 or earlier. Fig. 3 at the upper left-hand corner shows the filing jig for chamfering the magazine cover for a Maynard rifle with the piece in it, the edge showing as a black line. Below the filing jig is shown the piece itself with half a filing jig on either side of it. Below this is the jig for filing the Remington extractor with an extractor in it and to the right of it are disposed in the same order as above an extractor and the two halves of another extractor filing jig. To the right at the top half of the illustrations are shown two forms of trigger filing jigs and an inspector's trigger gage with a trigger in it. This latter gage and trigger date earlier than 1840.

Below the trigger is shown a breech screw inspector's gage or, perhaps more properly, templet, made of flat steel, and below it is a breech screw with 1839 stamped on it. On the left below the extractor filing jig a sear filing jig is shown with a sear next it. Below this is shown a guard bow in the flat with the ends turned and threaded ready for filing and below it is the filer's receiver.

All these methods are, of course, out of date now. The milling and profiling machines finish the bulk of the work. filing jigs are used for only a few of the parts. Instead of limits of 0.010, in many parts a limit of 0.001 is demanded in the new Springfield rifle, but the true mechanic feels a sensation of awe and respect as he handles the work of these old master armorers, and I doubt if there are many of our mechanics who could do as well using the appliances they used.

One old gentleman, who served his ap-

prenticeship in Birmingham, England, and came to this country about 60 years ago, told me that the gunsmith's apprentice in his day had to learn everything connected with his business even to cutting his own files.

## Face-plate Jaws

By Walter Gribben

A set of four jaws, of which one is shown assembled in Fig. 1, were made to be used on the face plate of a bench lathe, and have proved extremely useful during the short time that has elapsed since they were constructed. They are excellent for holding delicate ring-shaped pieces of work while operating on the base, or if the ring is not too small in diameter, it may be held in these jaws while operating on the outside surface. They are also good for holding an irregular-shaped piece of sheet metal that has to have a hole turned in it by means of a slide-rest tool. Another purpose for which they were designed was to hold the front board of a camera while boring a hole in it for the lens.

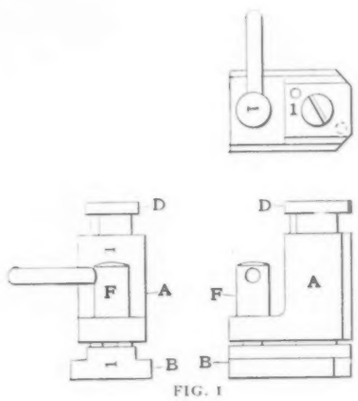


FIG. 1

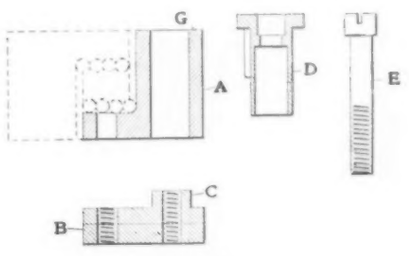


FIG. 2

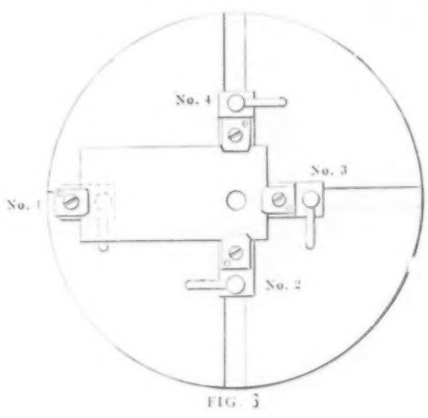


FIG. 3

FACE-PLATE JAWS

The main part of the jaw *A*, shown in section in Fig. 2, was made of 5/8x1-inch cold-rolled steel, the stock being cut off long enough for two jaws, as shown in dotted lines, after which a series of holes and two saw cuts separated them, and left very little stock to remove in finishing to shape. The nut *B*, shown in section in Fig. 2, was made of 1/2x3/4-inch cold-rolled steel, the wings on each side milled to fit loosely the T-slots in the face-plate, and the hub *C* turned to an easy fit in the long hole through *A*. The movable or clamping part *D* of the jaw, shown in section in Fig. 2, was made of 1/2x5/8-inch unannealed tool steel, the thin head being left the original size of the stock, while the round stem was turned to a working fit in the long hole through *A*. The screw *E* was made of drill rod, with the head spring tempered. None of the other parts were hardened.

The inner corners of *A*, *B* and *D* were beveled at an angle of 45 degrees to enable the jaws in neighboring slots to be set close to the center when holding small work. The head of *D* has a single dowel pin driven in tight, that works loosely in either of two holes in *A*. One of the dowel-pin holes in *A* is shown dotted in the plan view in Fig. 1. This enables the dowel pin in *D* to be placed always where it will not interfere with the work. *D* has the upper end counterbored so that the head of *E* will be flush with the outer face of *D*, while the long counterbore extending up from the bottom is for a spiral spring (not shown) that causes the two parts of the jaw to open for the reception of the work when screw *E* is slackened. The screw *F* holds the back end of *A*, and the handle is so placed that when this screw is tightened the handle will occupy about the position shown in Fig. 1. This prevents the handles from projecting beyond the edge of the face-plate when the jaws are set to take the maximum size of work. Each jaw and each T-slot was numbered, and after the jaws were constructed, they were all four assembled on the face-plate, but minus the parts *D* and *E*, and the top faces *G* of all four jaws turned off at once in order that they should be at the same hight above the face-plate. Then if one side of the work is flat, and that side is toward the face-plate, the jaws will have no tendency to spring the work in the flat when tightened upon it, and as the pressure on the work is parallel to the lathe spindle, and on solid metal, there is no tendency to spring a delicate ring out of round, as would be the case with an ordinary jaw chuck that gives a radial pressure on the work.

Of course, it is not so very easy to true up a job in jaws of this kind, supposing the work already has some turning or boring done on it, but a dial indicator helps along wonderfully. Setting the work properly in the jaws would be more easily done if it were possible to clamp the work tight in one jaw while the jaw itself was only partially tightened on the face-plate, and this was the end sought in the original design, but it had to be abandoned, as it would either involve a more complex construction, or else the work that could be held would be reduced to a narrower range of sizes. The jaws as finally made, and as shown here, will naturally clamp the jaw to the face-plate just as tightly as the two parts of the jaw grasp the work, as the screw *E* performs both offices.

Fig. 3 represents a rectangular piece of sheet metal with a hole already in it, which it is desired to make run true before doing any further work on it. About the only method of truing up the work in jaws of this kind, if the work is reasonably strong, is to clamp two opposite jaws tightly with screws *E* and *F*, say jaws Nos. 1 and 3, Fig. 3, while screws *E* in Nos. 2 and 4 are entirely slack. Then by tapping 1 or 3 with a mallet, the work can be shifted on the face-plate in the direction of 3 to 1 until about right that way, when *E* can be partly tightened in 2 and 4 and loosened in 1 and 3, after which 2 or 4 can be tapped with the mallet, and so on alternately until the work runs true. In case of a slender ring that would probably be sprung out of round in the truing process just described, the ring can be held in one jaw only while being trued up, after which the other jaws can be carefully applied to the ring. Fig. 3 also shows jaws No. 1 in a reversed position so as to bring the clamping point as near the edge of the face-plate as possible. In very irregular pieces sometimes only three of the jaws can be applied, and in other cases, especially with very small pieces, only two of them, but this is sufficient if the cuts are light.

---

A 4000-horsepower steam engine of the double horizontal type at the central electric generating station at Brussels, Belgium, has shown a consumption of 9.6 pounds of steam per indicated horsepower-hour with loadings from half to full load. The engine, which was built by the Van Den Kerchove Engine Company, of Ghent, has valves of the piston type, vertically arranged and operated from a lay shaft, and has 34½-inch and 60-inch by 60-inch cylinders. The piston speed is 828 feet per minute.—*The Engineer.*

# Practical Letters from Our Readers

A Round Table Discussing Details of Modern Machine-shop and Drawing-office Methods, Practice and Economy

## WE PAY FOR USEFUL IDEAS

### A Stock Rack

Fig. 1 shows a stock rack used for long finished pieces such as lead screws, feed screws, elevating screws and shafts. It has the advantages of being portable, compact, easy of access and absolutely fireproof. The base is a tripod affair and adjusts itself to the unevenness of the floor.

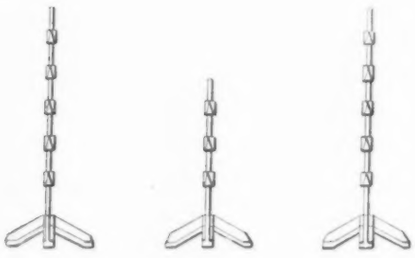


FIG. 1. A STOCK RACK

The babbitt-metal liner shown at *A*, Fig. 2, is to prevent marring the stock when drawing it out of the rack. Each arm is large enough to hold fourteen 1½-inch screws.

After introducing this rack in several shops I was glad to note that the old wooden and cast-iron ones began to disappear and in only a short time were entirely superseded by this style.

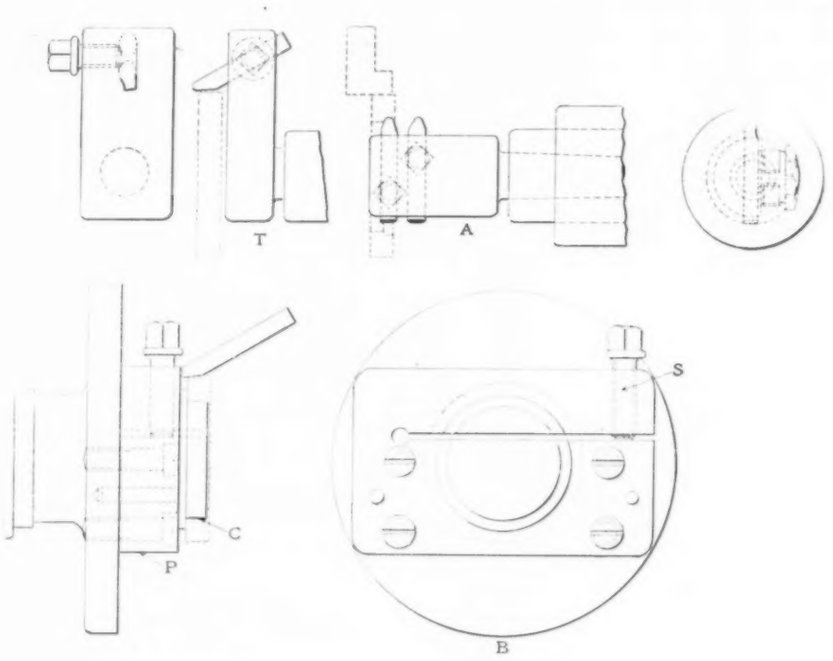
The flexibility of this construction should not be overlooked. Any number of hangers spaced any distance apart may at any time be added to or taken away by simply loosening the set-screws shown at *B*. An inverted base is sometimes fastened to the ceiling, thus making use of all the space possible.

By using three posts as shown in Fig. 1 the top may be used for long screws and the bottom for short ones.

Canton, O. J. SANKEY.

### Machining Brass Rings

Having a quantity of brass rings to machine the tools here described were used and served the purpose admirably. They were used in an engine lathe, no turret lathe being available, and the pieces produced were near enough alike and accurate enough for the purpose for which they were intended. For the first operation the pieces were gripped in a three-jawed chuck, faced with a tool in the tool post and bored with the double tool shown at *A*. For work of this kind that must be held lightly to prevent distortion, the single-point tool for sizing the hole is often to be preferred to a reamer.




TURNING BRASS RINGS

For the second operation the pieces were held by the fixture shown at *B*. Piece *P* was fastened to a face-plate by screws and dowel pins and turned at *C* to fit the rings, then split as shown and tapped for the screw *S*. With the ring in place the expanding screw *S* holds it securely. The tool *T* turned the outside and a tool in the tool post faced the side. The saving by doing them with this fixture over putting them in an ordinary mandrel is evident.

Cleveland, Ohio. W. R. G.

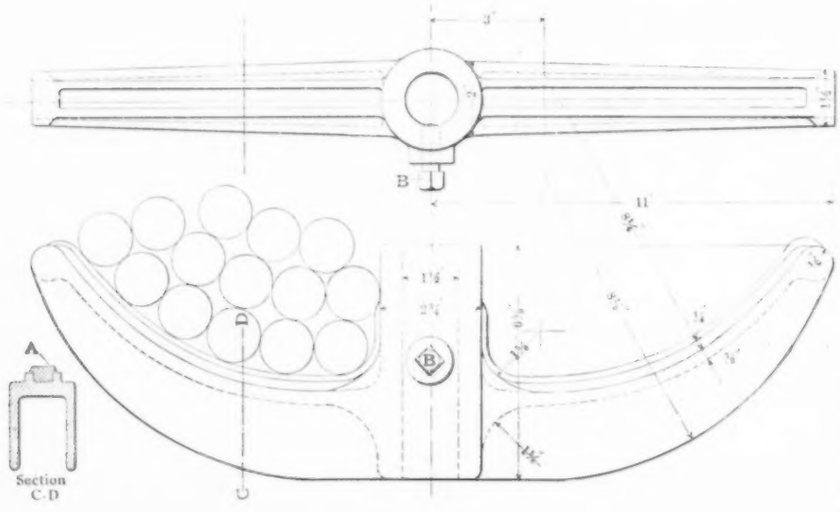
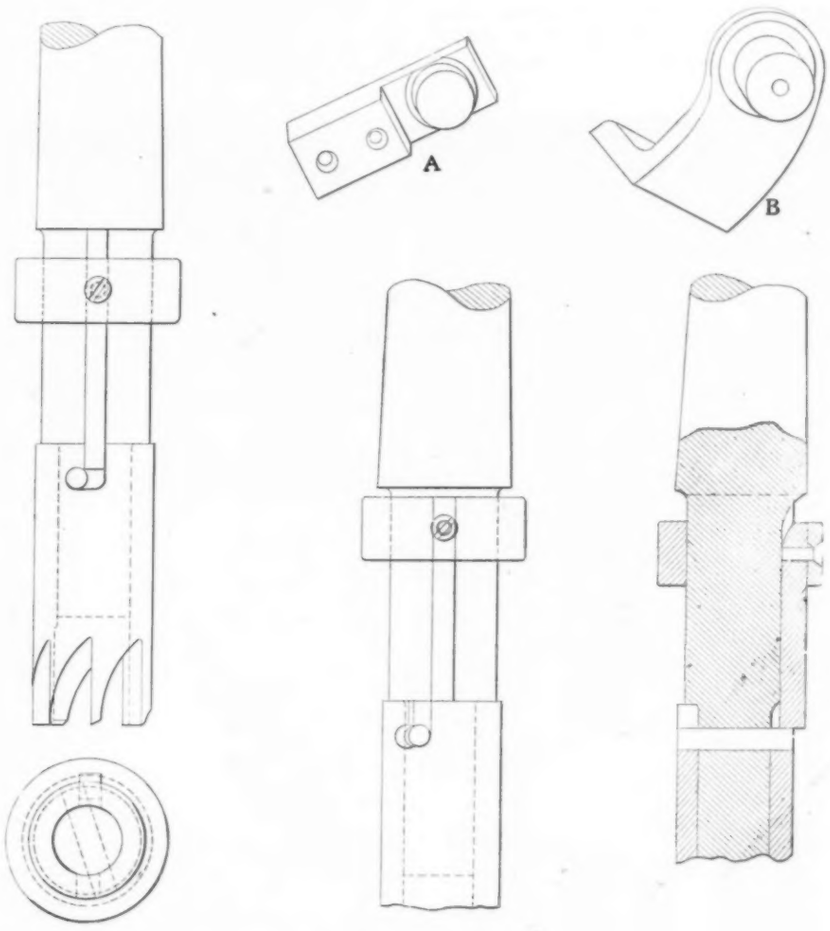



FIG. 2. THE BRACKETS

## Hollow Mill and Holder

In machining pieces similar to *A* and *B* the round hub or projection is generally done in the drill press with a jig by means of a hollow mill. If the work has to be very accurate two mills are used, one for roughing and the second for finishing.




HOLLOW MILL HOLDER

The mill and holder here described were designed to save time in changing from the roughing to the finishing and *vice versa*. The mill is driven in the same way as a shell reamer except that the slot instead of being straight, is shaped like an inverted *L*. The holder apart from the regular driving pin has a key way cut in the body a little behind the line of the driving pin, but not enough to clear it, so that when a key is fitted loosely in the key way the pin will stop it from dropping. A loose collar acts as a holder for the key, which is fitted to it and held by means of a screw. The mill merely has to be pushed up in place and turned slightly to the right and the key drops down in the slot and holds it firmly; to take it off it is only necessary to lift up the key by means of the collar and turn the mill a little to the left and it will drop down.

Montreal, Canada. FRED ROBERGE.

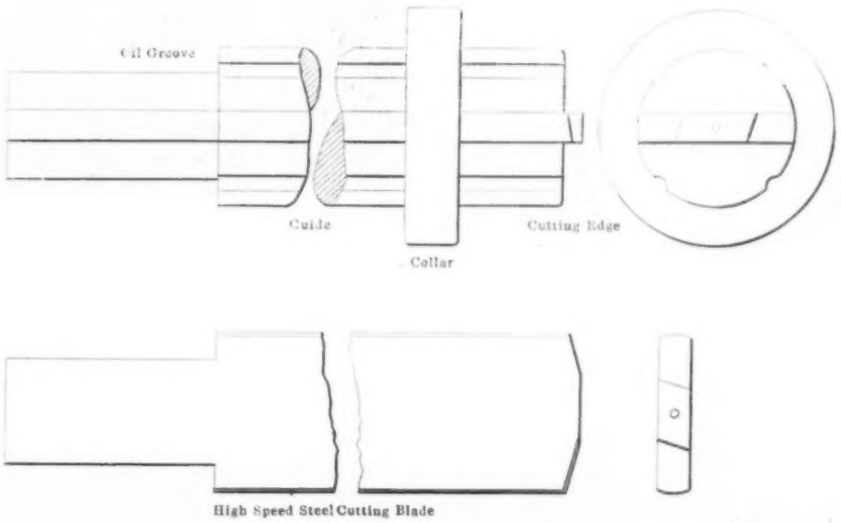
## High-speed Steel Drill for Cored Holes

Those who have had experience in drilling and reaming cored castings without the use of jigs, realize the difficulty of finishing the holes to size and location, especially when the cores are slightly misshapen or misplaced. This difficulty is often met with in experimental work and manufacturing in small quantities where adequate jigs would be too expensive. In steel castings especially does this difficulty occur. The two-flute drill is out of the question. The three-flute is little better, both of them wearing down the diameter very rapidly, requiring frequent grinding. On holes of 1 inch and upward this cost in time and tools is very appreciable, and getting the holes accurately located, when cores are not, is a difficult task. To overcome these difficulties the tools shown in the accompanying sketches were made and have given excellent service.

The cutting stock is high-speed steel 5/16 inch thick, rough turned on centers. The guides are common steel stock turned, oil grooves milled and then split in the dividing head with a 5/16 inch cutter and afterward case-hardened all over. These guides are then clamped by means of temporary collars, one on each side of the high-speed stock, which has previously been hardened on the cutting end only. The tool is then ground 0.005 to 0.010 inch under the finished size of the hole, to allow for reaming and a case-hardened collar made, which is a light press fit over the tool.

The cutting corners being ground to the desired angle the tool is assembled, allowing the cutting corner to project only about 1/16 inch from the end of the guides, which must be in line with each other. This allows room for the chips and also brings the guides into action soon after the cutting edge enters the hole. Where the core is out of place the hole should be laid out and the metal chipped and filed away on the thick side, making a seat for the drill to start in. The collar is pressed on far enough from the cutting end to allow the tool to pass through the work.

This construction gives the advantage of high-speed steel for cutting without the use of a heavy piece of expensive stock




DRILL FOR CORED HOLES

and slow machining to produce the tool. The guides coming in contact with finished surfaces only are not rapidly ground away as is the case with the clearance of drills and rose reamers, and even when they are so worn, they become smaller than the cutting edge diameter and so do not bind. The cutting edges may be easily ground on a tool or disk grinder or if necessary, by the use of a protractor and square can be satisfactorily ground on an ordinary emery wheel.

HARRY C. SATTERTHWAITE.

Indianapolis, Indiana.

## Turning Thin Disks

Fig. 1 shows the finished work, which is of tool steel. For work of this character, facing on an ordinary mandrel is too uncertain, as it must be perfectly parallel;

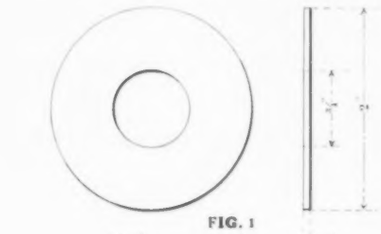


FIG. 1

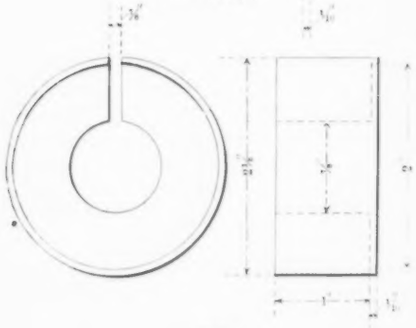


FIG. 2

TURNING THIN DISKS

therefore, the device shown in Fig. 2 was made.

The blanks are first bored out in a universal chuck in a lathe and then turned on a gang mandrel to fit exactly in the recess in the holder, which is held in a universal chuck. The closing of the chuck springs the holder down upon the work, holding it quite securely. The recess is just the right depth, thus admitting of the tool being set flush with face of the holder; a few thousandths variation in thickness being of no importance.

This holder may be equally serviceable for use in a grinding machine without a magnetic chuck.

By the aid of this holder we were able to produce accurate work and also greatly reduce the time required.

Philadelphia, Penn. R. G. DIETZ.

## A Thread-rolling Die for the Punch Press

Perhaps it would interest readers of the AMERICAN MACHINIST to read a description of a simple and inexpensive thread-rolling die for use in a punch press.

The Seng Company, of Chicago, manufacturers of stamped steelwork, etc., have in operation such a die doing excellent work. It is well adapted for rolling stock 3/8 inch and less; for larger sizes it would be necessary to increase the strength of the castings and the stroke of the press.

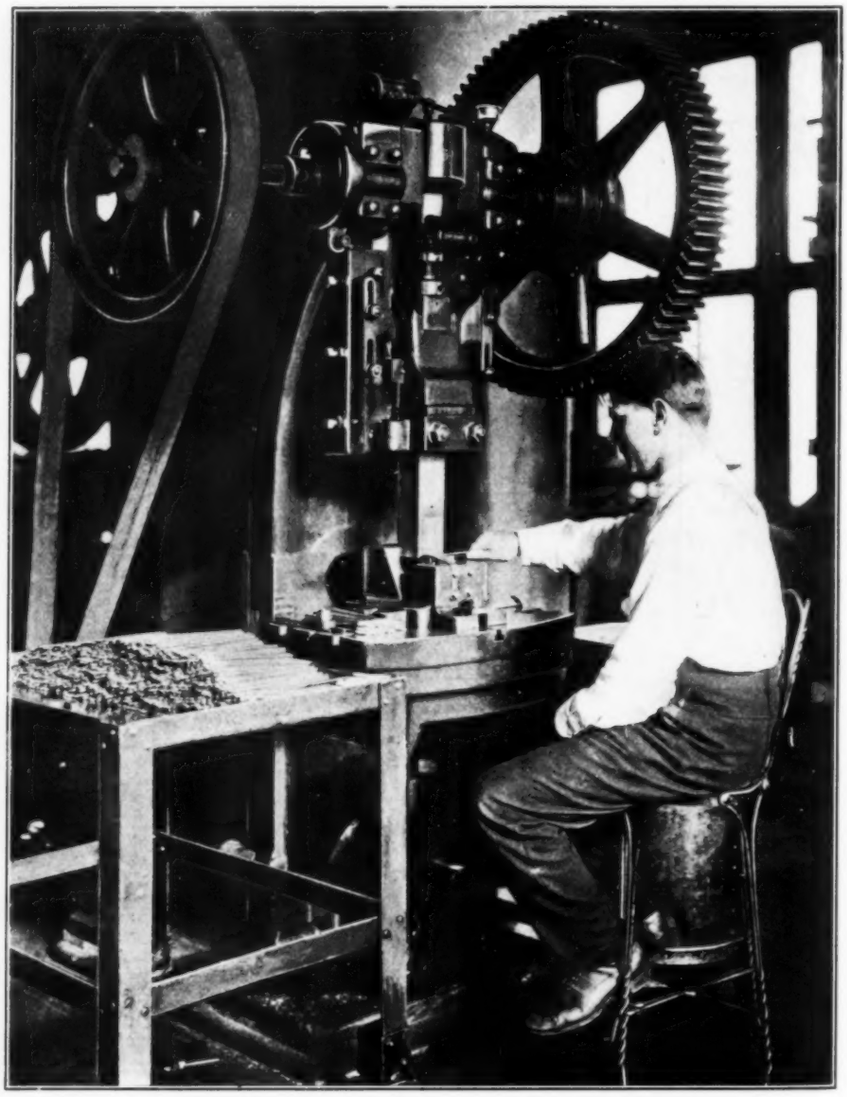


FIG. 1. ROLLING THREADS IN THE PUNCH PRESS

Fig. 1 is an illustration of the die when in operation, and gives a good idea of its general application, while Fig. 2, a shop drawing of this die, shows it in detail.

The lower die is held in the die shoe by four bolts, and must be properly fitted to the shoe. The die shoe, which is a casting, has a square hole through the center to admit the punch holder as it comes down. Directly opposite the die are two 5/8-inch rollers against which the punch holder presses as it comes down and rolls the thread. Above the rollers on each side are guide surfaces to prevent side motion, as both top and bottom die must always be in perfect alinement.

The die shoe is left open on both sides, as this makes it possible to feed from either side when on short work, saving the dies from wear. Any sort of single gage can be attached to suit conditions; two are shown in the drawing.

The punch holder into which the upper die is fitted is a square casting having a shank to fit the press. The back is steel-faced, as shown. When the press is on center, that is, with the crank up, the top die should be in the position shown in Fig. 2; the rods or bolts to be cut will then be held between both dies. The lower die is set perfectly vertical; the top is tapered equal to about the depth.

This die was designed for a 6-inch stroke, and for this size of work it would

not be advisable to use much less, as this must necessarily increase the angle at which the top die is set.

The angle of thread is found by the formula

$$tan. = \frac{sine}{cos.},$$

in which pitch = sine, and circumference of thread = cos. A simpler method is to take a piece of flat metal with one straight edge; from this edge and square to it, lay off a distance equal to the circumference of the thread; then a distance equal to the pitch at right angles to this; now draw a line connecting these points, and the angle can be measured with a protractor.

It is most advisable to make, or have made, a hob for the different sizes to be cut. It is then possible to put your block of steel into a milling machine and cut the threads quickly and accurately by simply swinging the chuck to the proper angle, remembering, of course, that the top die must be given taper as stated. Both dies are cut with one setting of the chuck; when brought opposite in the die they seem to cross, but this is correct.

When the dies become dull, they can easily be annealed and recut; they must be cut in the same grooves, however. To take up the amount cut away from the dies, block up the lower one with plates.

Threads cut on this die are very good. Its capacity is about 1000 per hour. It is easy to run and keep in order. Of course, it is necessary to use rods or wire smaller than the desired thread; this size is best determined by experiment after the die is made.

Chicago, Ill. ARTHUR T. KUNZE.

## Fixture for Grinding Bushings

In the accompanying sketch is shown a fixture for grinding bushings which I am using very successfully.

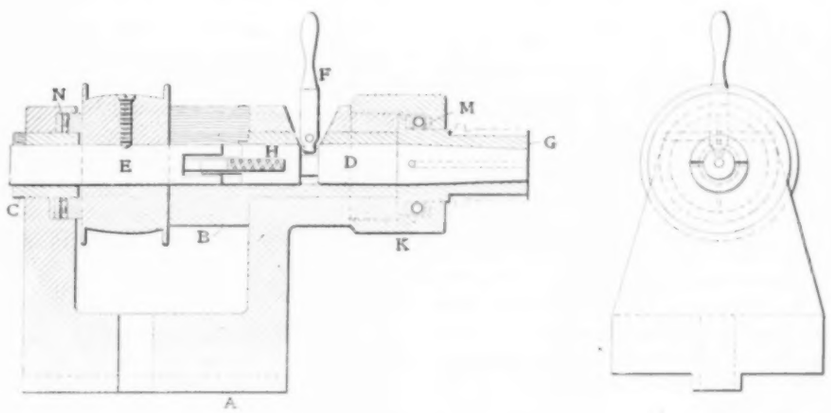
Having large lots of small bushings with shoulders at which the wheel must stop, I had considerable trouble in grinding them on an arbor as no two of them would stop at the same place on the arbor owing to a slight variation in the size of the holes, and I had, therefore, to reset the stops of the grinder for nearly every one.

In the sketch, *A* is a casting which is bored out and fitted with the bushings *B* and *C*. The spindle *D* is driven by shaft *E* and its pulley, and is made to slide back and forth in bushing *B* by means of the lever *DF*. Part *G* which holds the work is a split bushing ground to fit the taper on the spindle *D*.

When the lever is thrown to the right the taper end of *D* is drawn out of split bushing *G* which then contracts, and when the work is placed upon the bushing and the lever is thrown to the left, the work which is firmly held by the expansion of the bushing will run almost perfectly true with the hole, as *D* and *G* are ground together and the outside of the bushing is ground on the fixture.

The spindle *D* is kept from working out of bushing *G* by the spring and pin at *H* which thrust against shaft and pulley *E*. The cap *K* and the ball-bearing arrangement shown at *M* and *N* take the thrust of spring *H*.

The fixture can be used on any grinder and can be used for grinding almost any




FIXTURES FOR GRINDING BUSHINGS

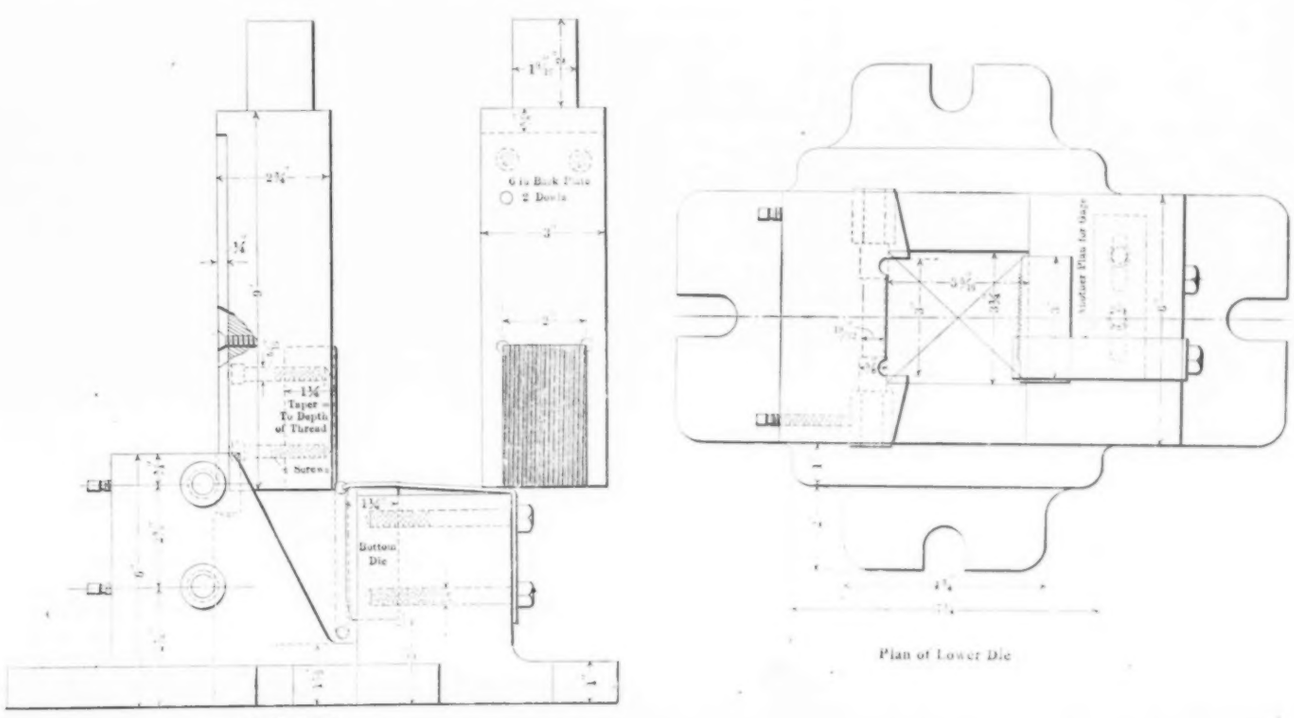



FIG. 2. THREAD-ROLLING DIES FOR THE PUNCH PRESS

kind of bushing by making a suitable bushing to take the place of *G*. I am grinding bushings on this fixture in about one-fifth of the time that is required with a regular arbor and I get a better job.

Claremont, N. H. A. A. STEARNS.

## Putting on and Taking Off Locomotive Tires

This was done in a small shop where we did not have facilities for doing this class of work. The wheels were about 55 inches in diameter. The tires had to be taken off in order to true them up. Before standing the wheels and axle *A* on end, I had a hole dug so that the crank-pin would not prevent leveling the wheels. After I had them about level a trench *B* was dug all around and partly under the wheel to the inside edge of the tire *C*. This trench was deep enough so that the tire *C* would have plenty of room to drop clear and also have room for fire and ashes. Dirt *D* was thrown on top of the center and completely covered it. A fire was then built in the trench *B* and when the tire had expanded enough, it dropped off of its own weight as shown in Fig. 1.

To put the tires on I placed the wheels and axle upright, just the same as when removing the tires. The tire *C* was then placed on top of the wheel *E*, as shown in Fig. 2. Four clamps were placed as shown, with iron blocking between them and the tire. Sheet iron was placed over the spokes of the wheel, a piece of stove-pipe over the crank-pin and dirt was heaped up on top of the sheet iron to keep the heat from the wheel. Next a fire, of wood, was built on the dirt and it did not take long to heat the tire sufficiently to have it go on. The blocking was knocked out and the tire dropped to the clamps.

The time on this was about 2 hours per tire, that included everything. Time to take off a tire was about the same. After this job was completed one would have never guessed that they had been taken off to turn them. The fire being on the inside did not tarnish them. They were as bright as when they came from the lathe.

Indianapolis, Ind. H. K. ANDRUSS.

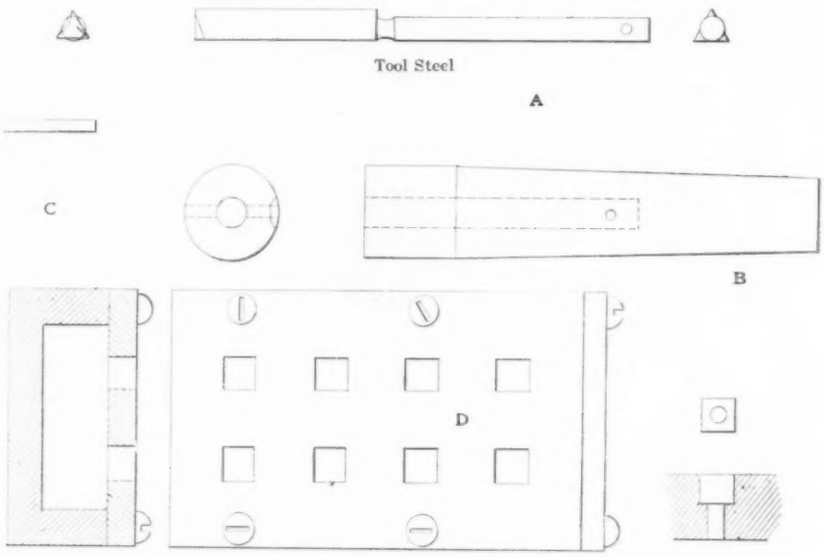
## Making Square Holes on the Drill Press

We had some square holes to make in slate blocks and the following method was tried and worked O. K. The first tools were made from old files and scrap material as nobody in authority seemed to place much faith in it. The recesses made are ⅜ inch square and about ⅜ inch deep. In the line drawing shown herewith *A* is the recessing tool, *B* the holder which serves the same purpose as the holder for a floating reamer, the tool being held by the pin *C*. In this case a ⅜-inch drill was run into the work the required depth of the recess, the slates were then placed in the jig *D* when the tool was fed into the work. The tool having but 3 corners would "walk" around the square holes in the jig and by having the round recesses made by the drill would obtain a bite into the work.

I have seen the same principle applied for making hexagonal recesses in small steel ratchets, so possibly this is not a new stunt for some.

Rochester, N. Y. JOHN COAPMAN.

[The same idea was used in making a geometric drilling device shown in Philadelphia about 1893.—ED.]




THE WORK AND THE TOOLS

## Chalking Tracing Cloth

Anyone who has ever done tracing knows that our modern tracing linen requires chalk to remove slight traces of oil. The old way was to scrape a little off a stick of chalk and rub it in with your hand or a piece of paper. Our tracers have adopted the talcum powder scheme of a tin shaker and powdered chalk.

There still remained the rubbing in, however, and it remained for a bright boy to devise a "rubber" which is very satisfactory. We get our pins in those desk rolls which are mounted in a wooden cup about 2 inches inside diameter. He simply took one of these empty cups, rolled up some ¼-inch thick felt and stuck it in. This left about ¼ inch projecting from cup and when the lower surface is chalked it forms an ideal device for cleaning tracings. Chalk adheres to it so that an occasional cleaning keeps it in fine shape.

F. W. HARRIS.

Wilkinsburg, Pa.

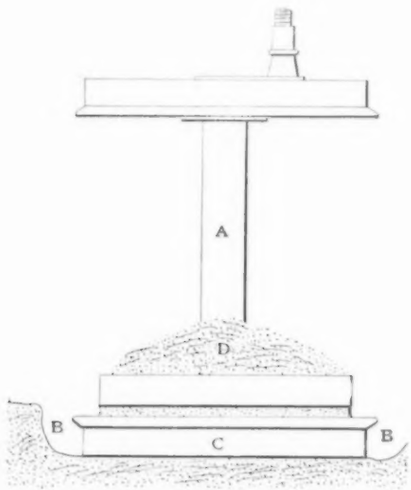



FIG. 1

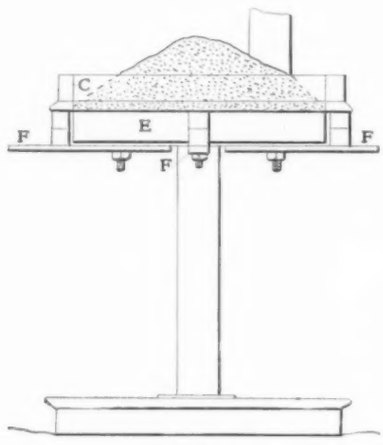



FIG. 2

TAKING OFF AND PUTTING TIRES ON

# Discussion of the Previous Question

Letters from Our Readers Showing How Many Men of Many Minds Look upon Various Subjects Opened up in Previous Numbers

## WE PAY FOR THESE ALSO

### Grinding Slitting Saws with a Cup Wheel

With regard to grinding the sides of milling or slitting saws with the cup wheel (or cylinder wheel, as Mr. Schliefer calls it), the gentleman in question does not mention the main point in the matter—that of "side clearance."

The writer was with one of the largest firms in the Middle West, who had from two to three hundred millers in the plant. They used a very large number of slitting saws of all sizes, mounted singly and in gangs, of from three up to 20, or more, on one arbor. They were used for cutting up metals, fibers and rubber.

These saws were used up to their highest capacity, the aim of the firm being to get the work out of the tools in the shortest possible time with no nursing.

The main essential in the saw itself was, that it should be a true job so that little trouble should be experienced from springing when mounting them on the arbor in gangs.

The method used to finish the sides was to hold the saws or cutters in a special fixture or chuck on the headstock of a large B. & S. universal grinder, using a large cup wheel suitably mounted on the end of the grinder spindle. To obtain the requisite clearance on the sides of the cutter, the wheel base, or slide, was thrown out of line slightly.

An ample supply of clean water was used, and the side of a large saw was finished in a few seconds.

The wheel-slide cross-feed was clamped fast and the saw fed up to the face of the wheel by the hand-wheel used to operate the work table.

S. Berkeley, Cal. W. L. Webster.

### Another Tapping Center

I cannot see why J. R. Jarvis should go to so much trouble to make a "spring tapping center," when he could accomplish the same thing by using the center that is usually found with the drill-press equipment, or pointing a piece of stock, and disconnecting the counterweight of the spindle.

In order not to drop the counterweight inside of the column I just slip a small piece of round stock through the chain close to where it enters the column. The weight of the spindle will be enough to hold any tap up to about 1 inch on an ordinary 30-inch drill press.

Pittsfield, Mass. Walter E. Malo.

### Loose Pulleys

At page 79, in his description of a very interesting milling machine, H. F. Noyes makes the statement that "the loose pulley....is simple and inexpensive, and if properly designed and oiled is seldom a source of trouble." There can be no possible disagreement with this, but when the drawing accompanying the description is examined, it will be open to question whether he has complied with his own requirements.

In Fig. 1 the arrangement of fast and loose pulleys as shown at page 79 is reproduced. In Fig. 2 an amended arrangement is suggested. The difference between the two designs is very small, but the writer's experience causes him to believe that the difference in the efficiency of the loose pulley would be very great indeed. There seems no good reason why the hub of the driving pulley should not be shortened and the hub of the loose pulley lengthened to bring the belt pull directly in the center of the bearing.

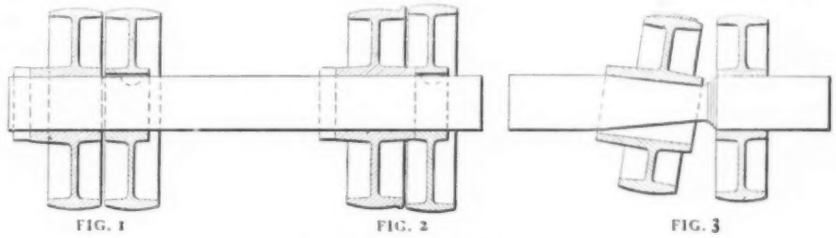


FIG. 1 FIG. 2 FIG. 3

LOOSE-PULLEY DESIGNS

If this can be done, the pressure on each unit of the bearing is even, and wear takes place equally over the whole length of the shaft. In the other case, however, the pressure at the edge of the bearing nearest the belt is greater than at any other point along the shaft, causing unequal conditions and resulting finally in a state of wear similar to that shown at Fig. 3, and lest it should be thought that the sketch exaggerates greatly, it may be stated that the writer has seen numerous countershafts returned for repairs in which the appearance of the shaft was fully as bad as the sketch shows. It will be noted also that the loose pulley is shown as of smaller diameter than the driving pulley. This is an old and much used device for lessening the wear on shafts and belts and could with advantage be adopted here.

Mr. Noyes employs a pump to lubricate the inside bearings of the bed. It would be interesting to know whether it is possible to oil the bearings in any other way than through the pump, and furthermore, if any trouble has been experienced by one bearing gumming up, and so being starved of its proper oil supply. With the ordinary arrangement of separate pipes for each bearing, it is easy to tell whether or not each shaft is getting its share. It does not seem quite as easy to determine that fact in this case.

Cincinnati, Ohio. A. J. Baker.

### Split Bushings for Turning Drill Shanks

Every tool room is confronted with the problem of repairing drills with broken tangs; therefore, too much cannot be said on this subject.

In our shop we overcome this difficulty by means of a machine-steel, case-hardened, split bushing, which is slipped over the drill and then placed in the three-jaw chuck so that the slot in the bushing comes between two jaws. Tightening the jaws will close the bushing, which will grip the drill, and hold it true. These bushings are first bored to fit drills of the desired size, then turned on a mandrel and split. A good way to split them is on a milling machine, using a 1/16-inch saw. The bushings should be at least three inches long.

It is advisable to center the drills, so that the tangs can be milled. All that is then necessary to hold the drills on the miller is to use the tailstock and the bushings, with the three-jaw chuck, as on the lathe.

This method may not be the best, but it has some advantages over others that have been described in the American Machinist. The bushings are especially useful in shops where a number of drills of one size are to be turned, or in rush work, provided the right size bushings are on hand.

Marysville, Cal. Chas. Brooks, jr.

[It would seem better in every way to use one of the drill sockets now on the market, that will drive the drills without having the shank returned.—Ed.]

## The Value of Visitors

I have read with interest the article on the value of visitors on Page 212. This mentioned the value received from the criticisms different visitors made regarding the equipment. I would speak of the gain received commercially by this same practice. Since our shop has been remodeled we have done away with our rope transmission and have had all of our machines arranged in groups. Each of these groups are driven by individual motors, these being connected up with the Renold silent chain. When we quote a customer at the office on this particular chain he naturally desires, before purchasing, to see it under working conditions. At this point we offer to show him a drive in operation, and taking him into the shop, we sometimes are able to show him a drive working under precisely the same conditions that he has to overcome. We have been able to secure a large amount of business through this very source. A visitor may have no other object than to observe the shop, but if he sees this method of transmission he is liable to mention it to his friends, whereby we may later on be the gainers. It is a good practice and I believe it pays.

Chicago, Ill. J. R. S.

## Grinding Inserted-tooth Cutters

We use about 20 inserted-tooth milling cutters of practically the same type as those shown at page 47, but instead of removing the blades and placing them in a fixture to grind them, we use a universal holder which has a revolving socket into which the cutter shank is placed. The holder is then swung around to whatever position is desired, and a spring stop used to index with, the end of the spring being set so that it touches the inserted blades just back of where they are being ground, care being taken that the spring is near enough in a straight line so that it will not slip when back pressure is applied. The universal holder used is not a special make, but is a regular stock fixture sent with one of our grinders.

Considering everything the chance for error is much less by this method than where the blades are removed, and the operation is quicker, and less trouble to perform.

### Making Nuts from the Bar

The comments of J. Hindley, on page 98, and the examples he gives from his own experience bring to mind my own experience in making semi-finished nuts from bars of hexagon cold-rolled steel in automatic screw machines. The nuts varied in size from ½ inch to 1⅛ inches in diameter, and were drilled and tapped to order.

When I first took charge of these machines the nuts were formed, drilled, tapped and cut off in them; the spindle speed was slowed down to do the tapping. It was this tapping business that was making the nuts cost too much to make, or at least that was the main item, for in order to do the tapping the machine had to be slowed down so much that the tapping alone took as much time as all the rest of the work put together. Another miserable thing was that in order to give the tap room the drill had to be run into the metal so far, that if it started to run crooked it couldn't straighten itself, and by the time the operator, who tended 10 machines, got around to it, both drill and tap had gone to smithereens.

As I had been hired to cut down the cost of this department, the first thing I did was to get the firm to order a four-spindle tapping machine—one of the kind that uses long-shanked taps that are taken out and dumped by hand when full of nuts. As soon as this machine was in place I took the taps and stops out of the automatic turrets and arranged the cams so that the drills would act as stops. This latter arrangement gave the drills a chance to cut the instant the chuck closed and also left only two tools in the machine, the forming tool which was also the cut-off, and the drill. As both of these tools acted at once, the nut dropping off but an instant after the drill snapped back, the time for making drilled nuts was about a third of what it had taken to make the tapped ones. The actual figures on one of the small sizes was from an average of 1100 to 3000 a day. These nuts were then tapped on the four-spindle tapper by a man getting $1.25 per day. By this arrangement, four automatics and a tapper did the work of 10 automatics doing their own tapping, with some to spare. The actual cost of nut production was not only greatly reduced, but we had six expensive automatics to put on other work.

### A Cheap Butt Mill for Brass Work

Referring to the comments of W. R. G., page 170, on my article under the above heading; the butt mills are not offered as original but simply as representing our shop practice. These mills were first made with a hole drilled in the center, as he shows, but this practice was discontinued in our shop for three reasons.

The first reason is that with the high-speed steel that we use, the mills have a tendency to crack in the flutes when hardened; we make the end of the mill as hard as possible. Whereas, when no hole is drilled in the center, no cracks develop. The second reason is that owing to the shape of the mill and the cutting requirements, no hole large enough to be of any real use can be drilled. In milling brass cock and valve bodies, only the outer points of the cutters do any work and the cutting edge is given a clearance to the center as well as at the back.

The third reason for discontinuing this hole is that, for the reasons just stated, it is absolutely necessary to grind or hollow out the center, to some extent at least, in which case the small hole cuts and wears away the small emery wheel used a great deal more than does the solid metal. We would not only not gain anything but actually lose on wheels. Besides one hollow grinding will last for eight or ten grindings of the edges.

As to the making of the mills in quantities, that is out of the question for us; for while the H. Mueller Manufacturing Company turns out as many, if not more brass cocks and valves for the plumbing trade, than any firm in the United States, the number of butt mills, of this kind, used does not exceed 60; as each mill is good for nearly three years of constant use the fitting up of a turret lathe for this job would be a waste of time. We run them through the toolroom in one or two dozen lots. If we used these mills on iron, or were making them for sale, it would be a different proposition.

We also use the flat mill, described by W. R. G., for some purposes, but for hexing work they require more speed to get smooth results and are inconvenient on account of the more bulky holder. However, all our special drills used on valve work are made of flat stock and held in a holder similar to his which I described in the American Machinist about a year ago.

Decatur, Ill. Ethan Viall.

## The Value of the Advertising Pages

Regarding the discussion now going on as to the use of the advertising pages of the American Machinist, I would like to call attention to an experience in our own shops. We were having trouble with a large belt on an electric motor on account of the joints not being flexible enough and giving a blow every time the lacing or fastenings came to the motor pulley.

I recommended a certain belt lacing machine which I had seen in use in other shops and was instructed by the works manager to secure details in regard to it, and to see where it could be bought. Their advertisement in the American Machinist contained no English address and no dealer in our town seems to know anything about it. As a result, we are now using a splice belt, but there is no question as to the sale of one of these lacing machines, if we had been able to get into communication with some one in this country who could supply it, or at least give us full information concerning it. Writing to the United States meant at least three weeks before a reply could be obtained, and we have not always been fortunate in receiving replies at all. I believe this is a point that advertisers should consider very seriously, and presume that many other sales have been missed in this same way.

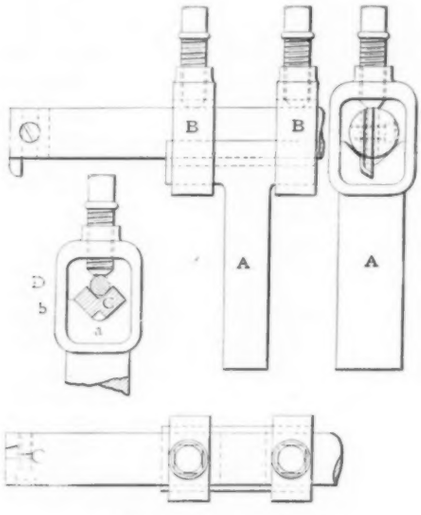
Darlington, England. Du Pont.

## Boring-tool Holder

The interesting article in a recent number entitled "The Evolution of a Boring Bar," prompts me to send you the inclosed sketch of a tool holder which is designed to take a boring bar as well as the ordinary forged boring tools.

In designing this tool holder one of the main ideas was to eliminate the use of shims. The holder may be said to consist of 4 pieces, *A*, the holder itself, forged of cast steel, *B B*, two clips or cramps of mild steel and each furnished with a cast-steel set-screw as shown; *C*, which is a piece of square cast steel of suitable length and having V's of 90 degrees at its opposite corners, these V's running its whole length. The holder *A* was machined up all over, placed in the slide rest, and the V for the bar was laid out at the hight of the lathe centers. This was then machined out carefully. The clips *B B* were made a push fit on *A* so they would hold on of themselves and yet be taken off readily when wanted.

The bar was made as shown, a slot across the end of the bar to take the bit, a saw cut and a fillister-head screw to hold it in position. This makes a solid and substantial bar, one that gives no trouble and will take out a good chip when wanted. The diameter of the bar is 1 inch in this case made of cast-steel.




BORING-TOOL HOLDER

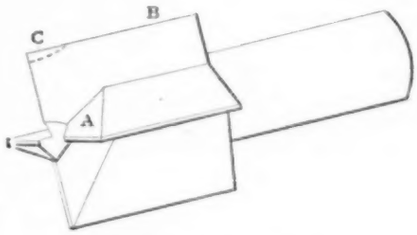
For smaller work solid forged tools may be used by putting the packing piece *C* in position as shown at *D*. It will be noticed that the cutting edge of the bit in the bar is in line with the center of the bar. The forged tools should be made the same, as this construction gives the maximum strength for any diameter of stock which may be used. Of course the bar will not be interchangeable with different lathes, but it may be made so cheaply that it pays to fit up each lathe with one of its own.

Birmingham, Eng. WILFRED GEORGE.

## A Cheap Butt Mill for Brass Work

I was much interested in reading an article by Ethan Viall, on page 604, Vol. 31, Part 1, under the heading "A Cheap Butt Mill for Brass Fittings and Similar Work." Acting upon the supposition that others were also, I submit the method we have followed in the making of such mills.

Our hexing machine is the same as the one shown by Mr. Viall, minus the air attachment and the upper set of spindles, and is the Warner & Swasey two-spindle type of machine. The grinder is the Cincinnati universal cutter grinder. We use




A BUTT MILL FOR BRASS WORK

round stock, cut to a length suitable for a pair of mills and center and turn the ends to size for a collet chuck used in the dividing head of a tool-room milling machine. This size leaves enough stock for grinding the ends to size after hardening. A parting tool is used and the blanks nearly severed at the center; enough stock is left to withstand the strain of milling the flutes, which are now milled; the blanks are held between centers. After milling they are gripped by the ends in a universal lathe chuck and parted and each mill centered with a special combined drill and countersink. They are now taken to the miller for the final operation before hardening, which is milling at *A* to form end cutters. After hardening the temper is slightly drawn, just enough to relieve strains, the shanks ground to size and the cutters sharpened along their parallel edges while held between centers. When grinding end cutters they are held in a fixture similar to the one shown by Mr. Viall.

While this method may exceed Mr. Viall's in cost, owing to the extra work on the ends of the cutters, I believe the resultant form of mill is more adapted to a variety of work. We often find it necessary to have mills of small diameter and both end and edge cutters are ground in sharpening. This gives us a variety of sizes, while only one size need be made and kept in new stock.

I do not wish to be understood as a critic but as the cutting is nearly, if not all done by edges *B* of these mills, I do not clearly understand how all sharpening can be done on the ends without what seems to me excessive grinding. As the stock removed by the mills sometimes exceeds ⅛ inch in depth, while in the ordinary work it is from 1/32 inch to 1/16 inch, this we find in our experience results in the mills dulling at *C* as indicated by dotted lines. Like Mr. Viall we run up against, and through a good deal of hard scale, sand, bits of steel, etc., and a cheap durable mill becomes a necessity.

I am much obliged to Mr. Viall for suggesting square stock, instead of round, for I see it means quite a saving in milling time in the tool room.

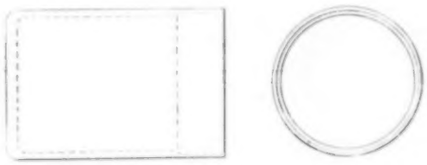
Wadsworth, Ohio. T. O. OHNAKER.

## Pressing Malleable Castings to Dimensions, versus Drawing from Steel Plates

On page 95, Vol. 31, Part 2, Mr. Longstreet describes an interesting operation on a press. I have seen some similar jobs done in the press and some others done in the drop hammer. There are some malleable castings that may be put into a drop hammer cold and "persuaded to straighten up" very effectively.

But I want to suggest that the job under consideration might have been modified slightly and then produced in a drawing press from a flat plate of steel. The boss shown on the end is not easy to produce in this way, but if we leave the whole end thick, as shown in the accompanying sketch, we would have a job similar to the ordinary cartridge shell and one which can be produced in large quantities very cheaply. The speed at which these could be produced should be about five or six per minute, instead of one in five minutes, as was the case in straightening the malleable-iron castings. Probably three or four operations will produce the cup from a flat sheet. Then the inside could be turned and the edge trimmed in the lathe, as he has described.

If the die had a double taper, like an hour glass, with a short distance parallel



CASING DRAWN FROM SHEET STEEL

at the smallest diameter, it would last longer and keep its size better.

Chicago, Ill. J. D. RIGGS.

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The imports of machinery into Japan in 1907 amounted to £2,827,600, and thus easily constituted a record, being £941,800, or 49 per cent. more than in 1906, and £1,490,800, or 112 per cent. in excess of the average for the preceding five years. Of this large total the United Kingdom supplied more than 52 per cent., which is the same proportion as she sent in 1906—*The Engineer.*

# AMERICAN MACHINIST

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## The Other Side of the Suggestion Box

Not many years ago our columns, as well as those of our contemporaries, contained numerous articles and references to the installation of suggestion boxes in factories, together with more or less elaborate plans for paying employees for useful suggestions brought to the notice of the managers through the medium of the box.

Of late we have seen much less of this, a fact which may be due to the common experience with new movements which attract wide attention when new, but which, later on, receive but little attention in print, even though they may be in large use. In this case, however, we believe the present absence of discussion to be due, in part at least, to the unsatisfactory experiences which some have had with the plan. Certainly as we go about the country and among shops we see but little of it, and on making inquiries we find that some have been disappointed in results, and have been obliged, even against their own wishes, to give up its use. We find those who are still in sympathy with the idea, but who say that its adoption was followed by so many unforeseen difficulties and annoyances that, with all their sympathy for it and all their recognition of the real value which it might be to the proprietors, they have felt compelled to discontinue it.

At the bottom of the plan was, we think, the basic idea, whether recognized or not, that a large proportion of the suggestions would prove to be useful and that their adoption with a substantial reward would lead to a spirit of coöperation and good will. Actual experience in some cases, at least, seems to be quite the opposite of the expectation. So far from most of the suggestions being good, the fact is that very few of them are good, while many of them are nothing more than ill-considered complaints. Under these circumstances the large majority of them must be rejected and this soon kills the interest in the plan among the working force. Authors of suggestions always, of course, consider theirs as worth adoption, and when most of them are rejected a comparison of notes among the force soon leads to a discovery of the fact by all, and the natural result of a loss of interest follows. In some cases, indeed, the result has been worse than this, rejections having been charged to ill will on the part of foremen and others and acceptances to favoritism, and so far from inaugurating an era of good feeling, the tendency of the plan has been to inaugurate an era of ill feeling. Such ill feeling has in some cases involved not only the relations between the proprietors and the force, but it has appeared among the workmen, those who have offered ideas that have been adopted becoming objects of aversion as supposed pets of the manager or foreman.

Some again have had their enthusiasm cooled by the presence in the shop of one or more chronic suggesters, who are always suggesting impracticable things, and following up their suggestions with insistence and importunity in a manner which has led to a little less than disgust on the part of all concerned. On the whole, it is perhaps this suggester of impracticable things who has done more than all others to bring the plan into disrepute.

Our readers are well aware that our columns gave a warm welcome to the suggestion-box idea, and we must confess to a large feeling of disappointment at these experiences with it, which have been related to us by those whose good faith and good intentions in connection with it cannot be disputed. The plan contains such large possibilities of usefulness that it is certainly a pity that malcontents and cranks should be able to destroy the usefulness and bring it into disrepute. We are very much afraid, however, that that is the fact, and that, admirable as the idea seems, the large hopes which many have felt for it must be seriously curtailed.

## Some Complaints of Customers

Makers of machine tools have varied experiences with customers regarding alleged defects, and many of them are exasperating in the extreme. Perhaps one of the most frequent cases of complaint is due to the different methods of measuring, or perhaps the different degrees of sensitiveness of the inspectors.

One case in mind is where a large number of armature shafts were rejected as being too small, when to all appearances they fitted the snap gages perfectly. A consultation and visit to the shop in question revealed the fact that it was their custom to force gages over the work. When the diameter had been reduced so that the gage could be forced over by hand, it was passed as right, neglecting entirely the spring of the gage and the variable quantity that was introduced by the different men. The shafts had been gaged in the usual way and were consequently one or more thousandths small when measured by the forcing method.

In another instance the base of a floor-boring machine was reported to be anything but flat, and a man was sent to see what the trouble was. It is almost beyond belief to state that he found the machine bolted down hard on an uneven floor without shims or wedges of any kind to level it up, and as a result the table was sprung considerably out of true.

Contrast that with that case of a tool builder who had been up against this very case. On receiving a new planer from one of the best firms he found the bed had a decided twist in it. He was satis-

fied the planer had been made right and came to the conclusion that the bed had taken a set on the cars from not being properly supported, or from the supports slipping during the journey. So he rigged a long lever that could be clamped around the bed and weighted in such a way as to twist it back into its original position. This was accomplished in a short time, less than would probably have been consumed in returning the planer and waiting for a new one. It shows the difference between sending a tool into a shop that knows good work and one that does not.

Many tool builders have learned that there were apt to be more kicks about inaccuracy from shops that never worked closer than a thirty-second, than from the shop that really knows what thousandths are.

## Evening Classes at Columbia University

Those of our readers who are located in New York will be interested in the announcement of evening classes during the coming winter specially adapted to the needs of technical and professional workers. They include work in applied mechanics, applied physics, architecture, electricity, fine arts, industrial chemistry, mathematics, and surveying and structures. The work begins on Oct. 26, and continues for 25 weeks. A full description of the courses is contained in the announcement of extension teaching, which may be obtained on application to the director of extension teaching, Columbia University, New York City.

## Edwin Burbank Pike

Edwin Burbank Pike, president of the Pike Manufacturing Company, Pike, N. H., passed away at his home on Monday, August 24, after an illness of one week, following an operation for appendicitis.

Mr. Pike was born in Haverhill, N. H., April 7, 1845, the youngest of six children born to Isaac and Sarah Pike, and the last to survive. His father died when he was but 14 years old and from that time on he was thrown upon his own resources. Ambitious and energetic even as a young boy, he worked hard to educate himself, studying for a while at Haverhill Academy and also at Newbury Seminary (Newbury, Vt.), working as he studied. When only about 17 years old he made his first trip selling whetstones. Feeling, however, that there was not enough opportunity for him in the whetstone business at that time, he soon took up other business. In 1861 he enlisted with the Union army; his mother prevented his going away then, but two years later, when he was 18, he went south and was connected with the supply and railroad department of the army for two years.

In the early 70's he accepted a position with the Enterprise Manufacturing Company, of Philadelphia, then in its infancy, established a few years previously by T. Henry Asbury. He was sole salesman for this firm for a while and afterward their head traveling salesman. His energy and genial personality were important factors in the rapid growth of this company, which has since become one of the largest manufacturers of its line in the world, and the personal friendships formed at that time with the founders of the Enterprise Manufacturing Company were among the most cherished of his life. Many of the senior members of hardware firms, now among the largest in the country, well remember his enthusiastic demonstration of Mrs. Pott's sad irons, Enterprise coffee mills and other specialties then radically novel.

In 1878 a severe attack of rheumatic fever obliged him to give up traveling for a time and he again took hold with his brother, A. F. Pike, in the scythestone business. His ever constant ambition to increase and extend any enterprise with which he was associated led to the organization in 1884 of the A. F. Pike Manufacturing Company, at which time was added to the manufacture of scythestones a general line of oilstones and other abrasives for sharpening tools. He was vice-president of this company. In 1889 the business of the company had increased to such an extent as to necessitate further expansion and the Pike Manufacturing Company was incorporated with his brother, A. F. Pike, as president and himself filling the office of vice-president and general manager of the sales end of the business. In 1891 the death of his brother placed the full responsibility of the business upon his shoulders, and from that time until his decease he was the president of the company. It is due to his tireless energy, aggressiveness and marked ability that the small business of 1823 is today the largest of its kind in the world.

Mr. Pike was president of the Pike Family Association from the time of its organization. For a number of years he was actively interested in the work of the National Association of Manufacturers, the American Hardware Manufacturers' Association, and various other organizations, but two years ago was obliged to withdraw for a time from active participation in this work on account of poor health. During the latter part of his life he took an active part in religious work, being a member of the Congregational church at Haverhill, until two years ago, when he became one of the charter members of the Bethany church at Pike, which was organized after years of effort on his part. He gave much time and thought to this work, seeking especially to awaken in the hearts of the children a love for the church and its worship and for everything good. He earnestly desired to see the erection of a beautiful church building and chiefly through his efforts a fund is now well started for this purpose.

Funeral services were held at his late home, Wednesday morning, August 26, conducted by his life-long friend, the Rev. John Barstow, and the Rev. Maurice J. Duncklee, until recently the pastor of the Bethany church at Pike.

Mr. Pike was a man of very strong personality and of a most genial, generous disposition. He was a genuinely public-spirited man, interested in everything that affected in any way the life of the town and always working for its material and moral betterment. Never was there a case of sickness or any misfortune that came to his knowledge but what he was quick to respond with many expressions of sympathy and good will. His heart and his purse were always wide open and many are the individuals who have been cheered and comforted and lifted over hard places by his ever ready thoughtfulness. He took great pride in his business, often saying that he felt that his company were producers in the best sense of the word, for they went into the earth and took from it that which did not impoverish it and which added in many ways to the benefit and comfort of his fellowmen.

## New Publications

THE SLIDE RULE. By Charles N. Pickworth, eleventh edition. 111 5x7-in. pages with 29 illustrations. Emmott & Company, Manchester; the D. Van Nostrand Company, New York, price $1.

That Mr. Pickworth's book has met a real demand is obvious from the number of editions through which it has passed. In the present edition the type has been reset throughout and this has supplied an opportunity for revision and the addition of new matter. The book is more complete than any with which we are acquainted and is, in fact, almost entitled to be called a treatise rather than a manual. In addition to the discussion of the more intricate problems of which the solution is possible on the ordinary slide rule, the author has gone more extensively than is customary into the numerous special forms of rules which are made in England, but many of which have not yet made their appearance here. The American reader will, in fact, be surprised at the activity of English instrument makers in bringing out instruments of new types and for special purposes, and many who are entirely familiar with the ordinary rule and its use will be well repaid for the cost of the book because of the fullness of the attention given to these instruments and the problems which they solve.

# New Tools and Machine Shop Appliances

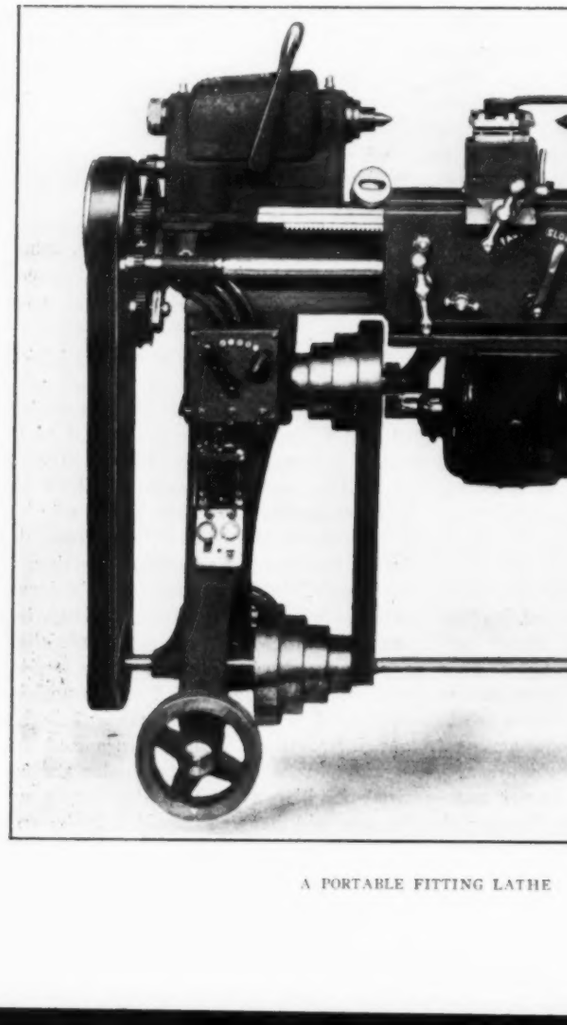
## Showing New Ideas in Machine Shop Equipment That Make It Possible To Do Better Work at a Reduced Cost

## THE LATEST INFORMATION

### A Portable Engine Lathe For Repair and Other Work

This lathe has been designed for use in fitting or repair work and can be taken directly to the machine being erected so that any small pieces may be fitted in the shortest possible time. It is electrically driven by the motor under the bed, the drive being through the cone pulley up to the head. The lever at the head engages with a positive clutch in the position shown and gives the changes of speed due to the four steps of the cone. Throwing this to the left engages a friction clutch; it gives a higher speed for filing or polishing.

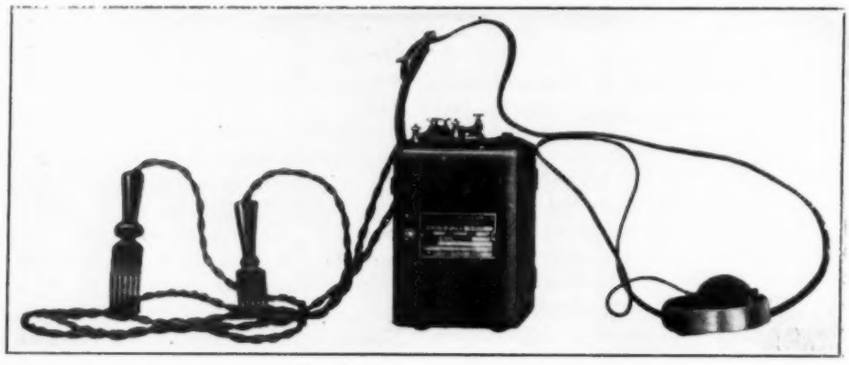
A chuck, shown with the slotted hole, is used for driving arbors, so that dogs are unnecessary, and work can be put in or taken out without stopping the lathe. A turret tool post enables four tools to be carried and two rates of feed are provided by simply throwing the lever in front of the apron to either fast or slow position. The machine can be easily handled by one man, as by raising the lever at the tail end of the lathe, the large swivel ball-bearing caster may be forced down to the floor and raises the leg so the whole machine can be easily moved. The machine is being built by the Rockford Drilling Machine Company, Rockford, Ill.



A PORTABLE FITTING LATHE

### The Electric Fault Finder

An instrument has just been brought out by the Electric Controller and Manufacturing Company, of Cleveland, Ohio, for detecting and locating grounds, short-circuits, open-circuits, leaks, and other faults in armature coils, field coils, control circuits, switchboard wiring, or any other electrical circuit. It not only indicates, but also locates the trouble. For instance, a faulty coil in a motor armature can be absolutely located and the nature of the trouble definitely told. If a field coil is damaged, the layer in which the fault lies can be absolutely determined. If there is trouble in a bunch of control wires, in a multiple



ELECTRIC FAULT FINDER

ELECTRIC FAULT FINDER TESTING ARMATURE

unit, train control, or other magnetic-switch control, the faulty wire or pair of wires can be promptly located and the nature of the fault quickly found.

The instrument consists of a small box provided with a strap so that it can be slung over the shoulder when testing motors in place, such as under a car or on an electric overhead traveling crane. From this small box leads go to a telephone receiver fitted with a headpiece so as to leave both hands free for testing. For working in very noisy places, such as bridge and boiler shops, or some parts of steel mills, the headpiece may be fitted with two receivers, one for each ear, which will shut out all sound save that received from the instrument. This arrangement not only allows perfect testing to be done in noisy places, but enables partially deaf persons to use the instrument. In one case by adjusting the rheostat to give a very loud sound (more than the normal ear could stand), and using two receivers, a very deaf man did very accurate work with this instrument. From the box leads of convenient length go also to two test terminals. It is cheap, small, portable, and requires no outside current to operate, and it requires only one man to operate under any conditions.

## A Tilting Drill-press Table

The three illustrations show the construction and the possibilities of this table so as to require very little description. The base is clamped in place of the regular drill-press table and can be turned in any position. In addition to this the table itself can be moved at any angle around its bearing as shown by the three positions and the work being done. Graduations enable it to be swung to any degree desired, so that it should be found extremely useful in many classes of work. It is made by the Williamson Vise Company, Bradford, Penn.

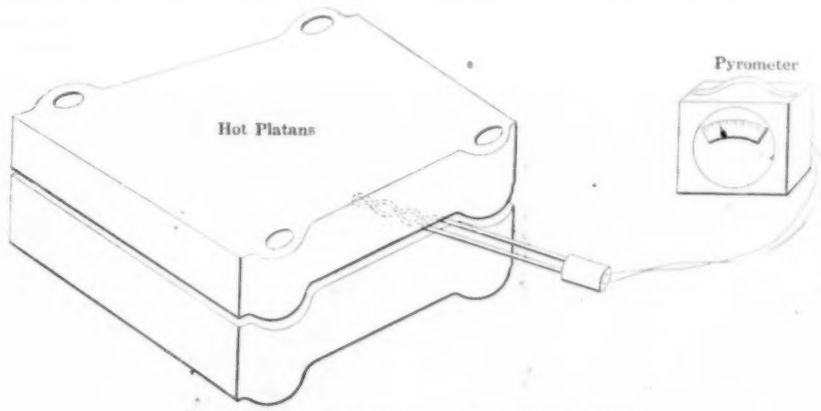
## Heat Variations in Hot Presses and Means for Its Determination

By J. C. Miller

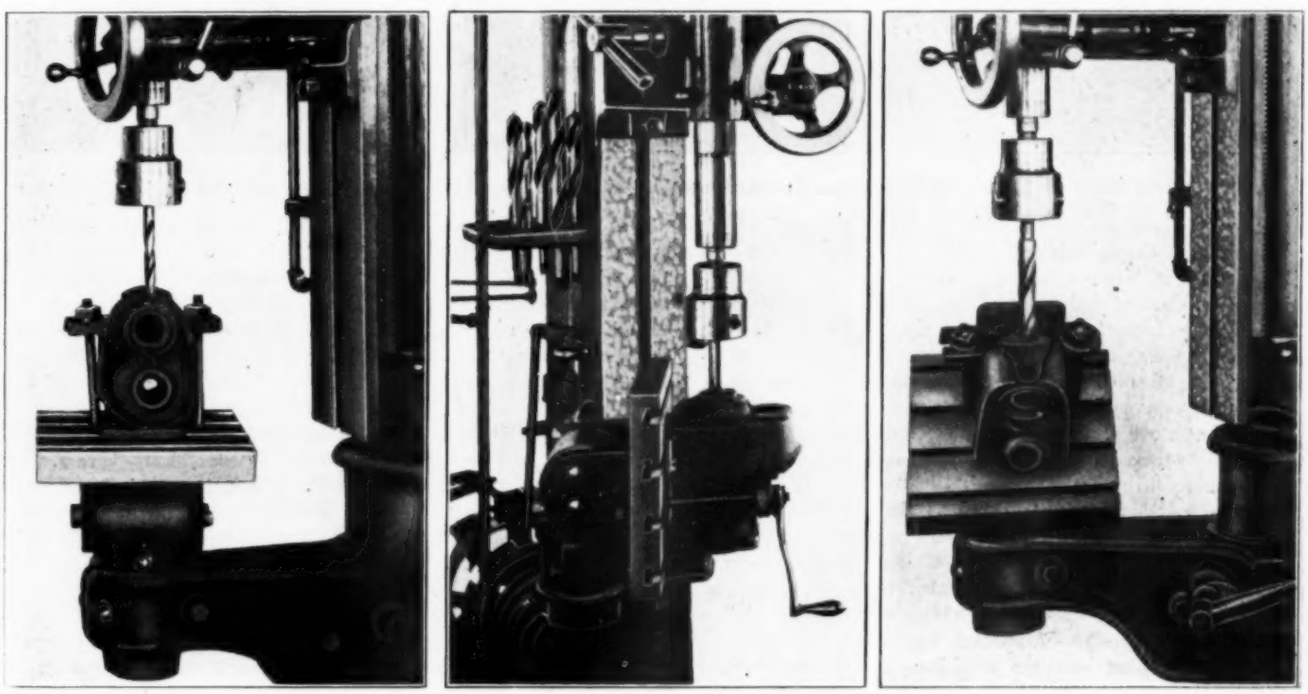
In a factory which recently came under the writer's notice, where plastic material was molded, under heavy pressure, in hydraulic presses, having steam-heated platens, there occurred a wide variation in the quality of the product. Several causes had been suggested as responsible for this variation, but finally it was narrowed down to heat variation in various parts of the bed.

The next proposition was to show and determine this variation which was successfully and easily done as follows:

Being unable to use a thermometer between the plates as used in practice, the ends of the two members of a thermo-couple, as used in the Hoskins pyrometer, were twisted tightly about each other and when subjected to the heavy pressure of the presses these were squeezed together giving a perfect electrical union. When the couple was connected up with its reading instrument and clamped between the various sections of the press, the variation in temperature was apparent at once. All the presses were tested in a few minutes, and a difference of five degrees was easily readable. Thus the long agitated question of uniform heat was settled in much less time than it takes to tell of it in this article. The accompanying sketch shows the general scheme and is simplicity itself.




MEASURING HEAT VARIATIONS IN HOT PRESSES



THREE POSITIONS OF A TILTING DRILL-PRESS TABLE

## Japanese Machinery Exports

Consul-General Henry B. Miller, of Yokohoma, submits the following report on the export of machinery from Japan:

The British commercial attaché in Japan says:

The export of machinery from Japan continues to advance yearly, the total in 1907 ($1,177,693) showing an increase of $447,718, or 61 per cent. over the preceding year, and of nearly 250 per cent. over the average of the last five years. The bulk consists of cotton gins and printing machines, which go to China, but Japanese workshops are now turning out various others kinds. Many of them may be fairly described as copies, more or less accurate, of foreign models. On the other hand, it must be admitted that the Japanese are often very clever in thinking out and executing labor-saving appliances. In a violin factory at Nagoya, where some 8000 instruments are annually turned out, ranging in price from $1 to $60 apiece, there were several simple machines at work, all, it is stated, invented by the proprietor and his employees, while it must be remembered that most of the tea-firing machinery used in the country is also admittedly of Japanese invention.

The exports of machinery are classified as follows: (1) Printing machines to China, Korea, Hongkong, and the United States of America; (2) cotton gins to China and British India; (3) electric dynamos and motors to China and Korea; (4) spinning and weaving machines to China, Korea and British India; (5) scientific instruments to China and Korea.

This advent of Japan into a machinery exporting country is a new phase of her industrial development, and rather a peculiar one when it is realized that the iron and steel necessary for making this machinery must be imported from foreign countries, either Europe or America.

There is a gradual development of the production of machinery in Japan along the lines of machinery used extensively within the country itself and generally throughout the Orient. Quite an extensive new machinery plant is being erected in Nagoya by the Mitsui Bishi Company for the production of cotton-spinning and weaving machines. They expect not only to produce machines of this type for use in Japan, but propose also to produce for export to China and British India. They claim to be able to produce a machine better fitted for the quality of cloth produced, especially for the oriental trade, as well as being designed especially to manufacture the cotton of India and the United States combined, than the foreign-made machinery which they assert does not handle this cotton to advantage.

There seems to be little doubt that, with the progressive spirit of the Japanese in the introduction and production of machinery that hand work in all possible lines will ere long be supplanted by machinery and factory methods. It is clearly evident from the expansion of the export of machinery from Japan to Korea, China, and British India, that they will carry on machinery production with some degree of success. Whatever success they achieve I feel convinced will be the result of producing machinery of a lower price and, from our point of view, inferior quality, but especially fitted for the conditions of the oriental market.

## The Schaap Welding Process

The illustrations show some of the many applications of the Schaap welding process, which has recently been made public, but which is the result of many years' experimenting. Briefly stated, the process consists of a blow pipe, or burner, not unlike the one ordinarily used in which the gas is first mixed with air of one pound pressure. After this is done, a high-pressure air supply of from 30 to 50 pounds is admitted, and the result is a flame which is hotter than any ordinary gas flame we have ever seen. The great advantage for the small shop is that no acetylene or oxygen is needed as only illuminating gas is used.

In Fig. 1, Mr. Schaap is welding a cracked automobile cylinder, using the iron from a broken piston ring to fill into the crack. No flux is necessary, as a good joint is made without anything except the metal flowed into the joint.

FIG. 1. WELDING A CRACKED CYLINDER

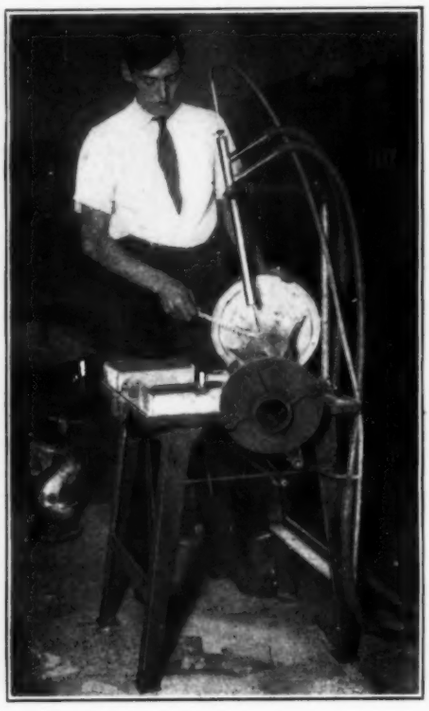


FIG. 2. REPAIRING AN ALUMINUM CASTING

FIG. 3. WELDING IRON UNDER WATER

In Fig. 2 an aluminum gear case is being welded, one of the most difficult jobs in this line of work, and a very satisfactory job was made in good time.

To show the heat of the flame as well as the force of the blast, several fire bricks were placed in a pail of water, a broken piston ring laid on these so as to be half an inch or more under water. The blast was strong enough to blow the water away from the joint, and the flame hot enough to weld the pieces in spite of the water surrounding everything but the joint itself. This is shown in Fig. 3.

Figs. 4 and 5 show a smaller blow pipe used for bench work, the former fusing metal into cracks of castings and similar

work, while Fig. 5 indicates how the flame can be controlled so as to be used for glass-blowing and similar light work. Burners can be made of any size and the volume of heat increased in that way for large work. Those who can will be interested to see this in operation at the Schaap Automobile Company, 344 Cumberland street, Brooklyn, N. Y.

## Industrial Training in the Fitchburg High School Course

The Fitchburg Iron Workers' Association, at a recent banquet to the members of the Fitchburg City Government and School Board, laid before them plans for an industrial school to be incorporated in the present high-school system, which were readily taken up by the City Government and have been put into operation.

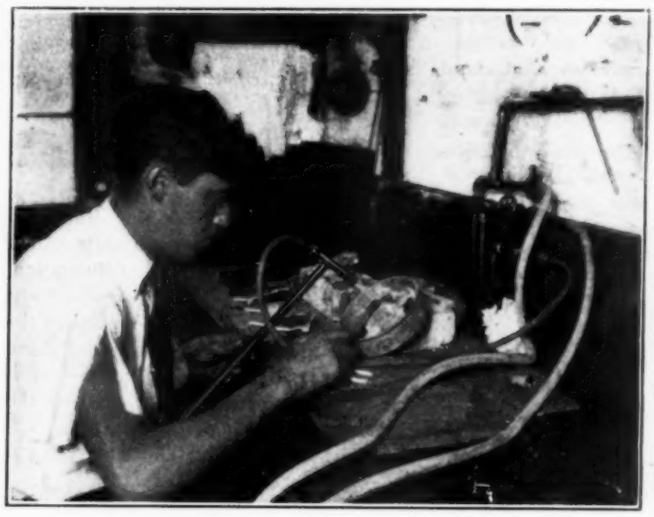


FIG. 4. SMALLER REPAIR WORK

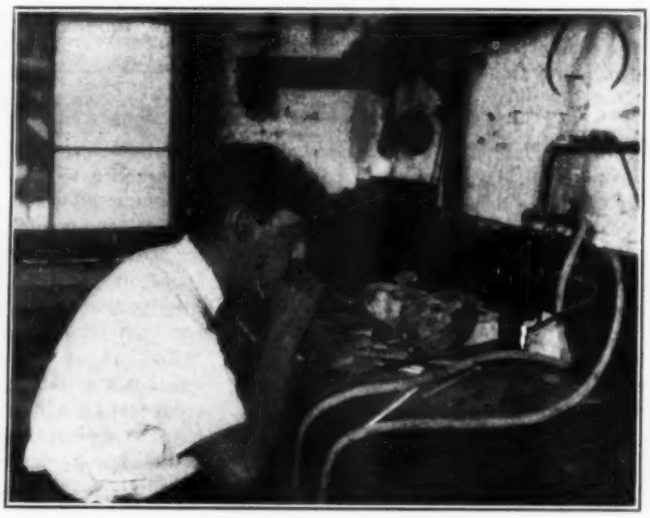


FIG. 5. USED FOR GLASS BLOWING

The idea is somewhat unique and bids fair to become an essential factor in industrial education in towns and cities of limited size throughout the country.

The plan is in the form of an apprenticeship system whereby boys, having passed the first year in the high school, take up during the next three years a mechanical course, studying one week in the school and the following week working in the shops. A special instructor has been employed and special textbooks provided. The boys are taken in pairs by the manufacturing companies. The boy who has studied in school a week on Saturday morning at 11 o'clock goes to the shop, and learns on what particular job his partner has been working and how it is handled, so that he can come in the following Monday morning and begin work where the other boy left off. Thus he follows the shop course without necessitating instruction on the part of the shop foreman.

Mr. Hunter, the man in charge of this work, has had more applications than could be taken care of the first year. At the present time all the boys are working in the shops and will continue to do so until the school opens. The school course is as follows:

FITCHBURG HIGH SCHOOL

COOPERATIVE INDUSTRIAL COURSE

FIRST YEAR, ALL SCHOOL WORK

| Subject. | Periods per Week. |
|---|---|
| English | 4 |
| Shop mathematics | 5 |
| Mechanics | 5 |
| Freehand and mechanical drawing | 5 |
| Current events | 2 |

SECOND YEAR, SCHOOL AND SHOP WORK

| Subject. | Periods per Week. |
|---|---|
| English | 4 |
| Shop mathematics | 5 |
| Chemistry | 4 |
| Electricity and heat | 4 |
| Freehand and mechanical drawing | 8 |

THIRD YEAR, SCHOOL AND SHOP WORK

| Subject. | Periods per Week. |
|---|---|
| English | 4 |
| Shop mathematics | 4 |
| Commercial geography, business methods and conditions | 4 |
| Advanced chemistry or industrial chemistry | 5 |
| Freehand and mechanical drawing | 8 |

FOURTH YEAR, SCHOOL AND SHOP WORK

| Subject. | Periods per Week. |
|---|---|
| English | 4 |
| Civics and American history | 5 |
| Applied mathematics | 5 |
| Mechanical and freehand drawing | 8 |
| Discussion of current mechanical appliances | 2 |

The shop work consists of instruction in the operation of lathes, planers, drilling machines, bench and floor work and other machine work, according to the ability of the apprentice and pertaining to the particular branch of manufacture in the shop where he is employed. The rules and conditions of this system are:

RULES AND CONDITIONS

Rules and condition under which special apprentices taking the four-year coöperative industrial course at the high school of Fitchburg are received for instruction at the works of

.....

First. The applicant for apprenticeship under this agreement must have met satisfactorily requirements for entrance to this course at the high school.

Second. The apprentice is to work for us continually, well and faithfully, under such rules and regulations as may prevail at the works of the above company, for the term of approximately 4950 hours, commencing with the acceptance of this agreement and in such capacity and on such work as specified below:

Lathe work, planer work, drilling, bench and floor work.

And such other machine work, according to the capacity of the apprentice, as pertains to our branch of manufacturing.

This arrangement of work to be binding unless changed by mutual agreement of all parties to this contract.

Third. The apprentice shall report to this employer for work every alternate week when the high school is in session, and on all working days when the high school is not in session, except during vacation periods provided below, and he shall be paid only for actual time at such work.

Fourth. The apprentice is to have a vacation, without pay, of two weeks each year during the school vacation.

Fifth. The employer reserves the right to suspend regular work, wholly or in part, at any time it may be deemed necessary, and agrees to provide under ordinary conditions other work at the regular rate of pay, for the apprentice during such period.

Sixth. Should the conduct or work of

the apprentice not be satisfactory to employer, he may be dismissed at any time without previous notice. The first two months of the apprentice's shop work are considered a trial time.

Seventh. Lost time shall be made up before the expiration of each year, at the rate of wages paid during said year, and no year of service shall commence till after all lost time by the apprentice in the preceding year shall have been fully made up.

Eighth. The apprentice must purchase from time to time such tools as may be required for doing rapid and accurate work.

Ninth. The said term of approximately 4950 hours (three-year shop term) shall be divided into three periods as stated below, and the compensation shall be as follows, payable on regular pay days to each apprentice:

For the first period of approximately 1050 hours, 10 cents per hour.

For the second period of approximately 1650 hours, 11 cents per hour.

For the third period of approximately 1650 hours, 12½ cents per hour.

Tenth. The above wage scale shall begin the first day of July preceding the apprentice's entrance upon the first year of shop work of the high-school industrial course. The satisfactory fulfilment of the conditions of this contract leads to a diploma, to be conferred upon the apprentice by the school board of Fitchburg upon his graduation, which diploma shall bear the signature of an officer of the company with which he served his apprenticeship.

## Ribbing of Cast-iron Beams

By E. H. Fish

I was asked some time ago to figure the strength of several cast-iron condenser shells. The shells were box shaped, but they were so long that in figuring a section near the middle they could only safely be figured as if they received no added strength from the heads. They were only lightly ribbed; the ribs themselves while quite wide were very shallow, in fact they only stood up an amount less than the thickness of the plates. After going through the figures I roughly checked them by figuring the strength of the plates alone, that is, without the ribs, when to my surprise I found that if my computations were right the condensers would have been stronger with the ribs off. A careful review of my work confirmed the first figures and a little thought showed that it was possible to design a beam so that an added rib might easily be a source of weakness.

In Fig. 1, if a rib is added at $a$ it carries the center of gravity of the cross-section of the beam, and with it the neutral axis, somewhat toward the top of the section, but so little that the distance from the "most strained fiber" on top of $a$ to the neutral axis is greater than before. If the added rib is small it may increase the moment of inertia of the section so little that when it is divided by $e$ to get the section modulus it will give a smaller modulus with the rib than without it. Consequently there will be a smaller working strength.

In the case referred to the shells were cast iron, and as the ribs were on the outside all the way around they made the thing particularly dangerous at the corners which were rounded on a rather small radius. The bending due to a vacuum in the condenser is in a direction tending to put the ribs on the tension side. In any

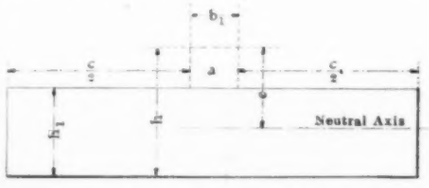



FIG. 1. RIBBING OF CAST-IRON BEAMS

case, however, it would probably be better practice to design such shells for a maximum allowable fiber stress of, say, 3000 to 4000 pounds per square inch with the assumption that the neutral axis remains at the center of gravity of the cross-section until this working strength has been long passed.

To find a means for determining whether a certain rib on a certain size of cross-section will strengthen it or not, I have worked out a formula. The mathematics leading up to the example which I will give are reproduced here solely for the benefit of anyone who may wish to question the correctness of the result.

The formula for the moment of inertia of a T-shaped or L-shaped section, Fig. 1, is:

$$I = \frac{b_1 h^3 + c h_1^3}{3} - \frac{(b_1 h^2 + c h_1^2)^2}{4 (b_1 h + c h_1)},$$

and for $e$, Fig. 1,

$$e = \frac{2h - (b_1 h^2 + c h_1^2)}{2}.$$

Dividing $I$ by $e$ and putting the quotient equal to the section modulus for the rectangular section of width $c$ and depth $h$, we have:

$$\frac{\frac{b_1 h^3 + c h_1^3}{3} - \frac{(b_1 h^2 + c h_1^2)^2}{4 (b_1 h + c h_1)}}{\frac{2h - b_1 h^2 - c h_1^2}{2}} = \frac{c h^2}{6}.$$

Clearing of fractions we have:

$$\left.\begin{array}{l} b_1^2 [h^3 (h + c h_1^2)] + \\ b_1 [c h h_1 (4 h^2 + 4 h_1^2 - 8 h h_1 + c h_1^2 + c h h_1^2)] \\ + c^2 h_1^2 (h_1 - 2h + c h_1^2) = 0 \end{array}\right\} (1)$$

which is a quadratic equation in $b_1$ and from which $b_1$ may be found in terms of the other dimensions. It is much easier, however, to substitute the values of $h$, $c$ and $h_1$, in the equation in the form above and then solve for $b_1$.

For instance, suppose that we have a plate in which $c$ is 10 inches, $h_1$ is 1 inch and we wish to see how wide the rib $b_1$ must be if $h$ is 2 inches, then substituting in equation (1) we have:

$$8 b_1^2 + 1000 b_1 + 700 = 0,$$

$$b_1 = 11/16 \text{ inches.}$$

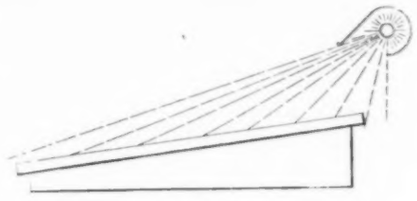
So, for the case taken, unless $b_1$ is at least 11/16 inches wide there would be no object in adding the rib.

In case $b_1$ is assumed and any other dimension figured for, equations involving the third, fourth or even sixth powers of the unknown quantities are found. If the hight of the rib is wanted on a plate whose whole width $(b_1 + c)$ is given the same trouble presents itself. Since only approximate results are ever needed the above solution is the most convenient for use.

## Mercury Vapor Lamp on the Drawing Board

By E. F. Warren

The sketch herewith illustrates diagrammatically an arrangement I devised some time ago which provides the draftsman with plenty of light, and that right where he wants it. As seen in the illustration, the source of light is a Cooper-Hewitt mercury vapor lamp placed parallel to the back edge of the drawing board and above and back of it in such a position that it will not interfere with the use of the T-square and triangles or drafting machine if that is used. The shade or reflector is so shaped that the entire area of the drawing board is flooded with an abundance of light which has been found to be of an excellent quality for the purpose. At the same time the draftsman's eyes are shaded from the direct rays of light, thus making it easier for him, for at best working by artificial light is much harder than with good daylight. The draftsman is also enabled to work to the extreme back of the board without in any way getting in his own light. Since the source of light is continuous, the full length of the drawing, the triangles do not throw a shadow no matter what their location, and, of course, the light is always in front of the T-square.



LIGHTING THE DRAWING BOARD

The frame for holding the lamp is pivoted at one end to permit of tilting the lamp when starting it.

## Personal *

C. C. Badeau, formerly chief engineer of the Switchboard Equipment Company, Bethlehem, Penn., is now occupying a similar position with the Condit Electrical Manufacturing Company, of Boston.

The College of Engineering of the University of Illinois, announces the following new appointments for the college year beginning September 16, 1908:

Lewis McDonald, B. A. and B. S. in civil engineering, University of Illinois, '08, has been appointed assistant in civil engineering.

C. F. Kelley, A. B., Harvard University, '06, a student with De Camp, and other noted artists, has been appointed instructor in architecture.

A. M. Elam, B. S. in mechanical and electrical engineering, State University of Kentucky, '08, has been appointed assistant in general engineering drawing.

J. G. Kemp, A. B., University of Illinois, '06, and for the past two years assistant in physics at Purdue University, has been appointed assistant in physics.

E. C. Converse, A. B., University of Illinois, '04, and for the past four years a teacher in the public high schools, has been appointed assistant in physics on part time.

C. C. Albright, B. S., Purdue University, '03, C. E., '08, and for the past five years engaged in railway work, has been appointed instructor in civil engineering.

F. W. Doolittle, a graduate of Lenox College, A. B., Princeton, a graduate in civil engineering, University of Colorado, '07, has been appointed instructor in theoretical and applied mechanics.

A. R. Lord, B. S. in civil engineering, University of Maine, '07, and for the past year instructor in civil engineering of the same institution, has been appointed instructor in general engineering drawing.

A. St. J. Williamson, University of Illinois, B. S. in mechanical engineering, '98, M. E. '02, and for the past seven years engaged in railway work, chiefly with the Mexican Central railway, has been appointed instructor in railway mechanical engineering.

Kenneth G. Smith, A. B., University of Chicago, '96; B. S. in mechanical engineering, University of Illinois, '05; for three years with the Kerr Turbine Company, has been appointed to have charge of the engineering experiment station extension work with the rank of assistant professor of mechanical engineering.

William F. Shulz, a graduate of the Baltimore Polytechnic Institute in 1890, an honor man at Johns Hopkins University, '93, Bachelor of Science in Electrical Engineering, University of Illinois, '00, Ph. D., Johns Hopkins University, '08, For five years assistant and instructor in physics at the University of Illinois, has been appointed assistant professor of physics.

F. D. Crawshaw, B. S. in electrical engineering, Worcester Polytechnic Institute, '96, who has served as head of the manual training department of the Central High School, Minneapolis, Minn.; as first assistant, manual art department, Bradley Polytechnic Institute, and as principal of the Franklin School, Peoria, Ill., to be assistant dean of the College of Engineering.

Frank B. Sanborn, B. S., Dartmouth, '88; C. E., Dartmouth, '89; M. S., Harvard, '98; for nine years past, professor in charge of the department of civil engineering, Tufts College, has been granted leave of absence for one year by that institution and during this time will act as assistant professor of civil engineering with the University of Illinois, doing work not otherwise provided for during the prospective temporary absence on leave of Prof. I. O. Baker.

Shelby S. Roberts, B. S., Rose Polytechnic Institute, '98; C. E., Rose, '97; for the past ten years engaged in railway work, chiefly with the St. Louis, Peoria & Northern railway, the Louisville & Nashville, and the Illinois Central, has been appointed assistant professor of railway civil engineering. Mr. Roberts will give his entire attention to instructional and research work with reference to railway-track construction and maintenance, and with reference to railway signaling.

*Items for this column are solicited.

## Business Items

The Cleveland Crane and Car Company, of Wickliffe, Ohio, has opened an office at 1203 Marquette building, Chicago, Ill., with W. A. Rider in charge.

The Crocker-Wheeler Company, of Ampere, N. J., has opened a new office in the Gumbel building, Kansas City, Mo., for the sale of C-W motors, dynamos, transformers, switchboards, etc. The office is in charge of A. W. Paine, who will give personal attention to business in Kansas City and vicinity.

## Trade Catalogs

The Industrial Oxygen Company, New York City. Pamphlet describing and illustrating autogenous welding.

Westinghouse Air Brake Company, Pittsburg. Pamphlet describing and giving instructions for use of air-brake equipment.

Manning, Maxwell & Moore, New York City. Pamphlet describing automatic valve grinding machines. Paper; illustrated.

Lyon Metallic Manufacturing Company, Chicago, Ill. Catalog of steel factory equipment. Illustrated, 48 pages, 6x9 inches, paper.

The Rockwood Manufacturing Company, Indianapolis, Ind. 1908 edition of book on Friction Transmission. Illustrated, 84 pages, 6x9 inches, paper.

## Business Opportunities

The Novelty Machine Company, Wilmington, Del., will enlarge machine shop.

The Janson Steel and Iron Company, Columbia, Penn., will enlarge its plant.

The Dayton (Ohio) Paper and Novelty Company will erect a new four-story building.

The California Door Company, Diamond Springs, Cal., will erect a large planing mill.

The Wymojo Yarn Mills, Rock Hill, S. C., will establish machine shop for repair work.

The Enterprise Foundry Company, Sackville, N. B., will rebuild plant recently burned.

The William F. Mosser Company, Fayetteville, W. Va., will erect a tannery at Richwood.

The Washington (D. C.) Railway and Electric Company has purchased site for a new car house.

The Atlantic Lumber Company, Birmingham, Ala., will establish a planing mill at Brookwood, Ala.

Condon Lane Boom and Lumber Company, Horton, W. Va., will rebuild pulp mill destroyed by fire.

The plant of the Corry (Penn.) Handle Company was destroyed by fire on August 22. Loss, $25,000.

The Cleveland (Ohio) Foundry Company is having plans prepared for a five-story stove foundry.

A. Cameron, of Vass, N. C., will build a mill for the manufacture of cotton yarns at Charlotte, N. C.

Hornung & Wolf, Buffalo, N. Y., manufacturers of tin cans, etc., will have a $30,000 addition erected.

It is reported that the Louisville & Nashville Railroad will build a roundhouse on its property in Selma, Ala.

The Shevlin-Mathieu Lumber Company, Spooner, Minn., will rebuild mill recently destroyed by fire.

The Woonsocket (R. I.) Machine and Press Company will erect an addition to cover 38,000 square feet of land.

The Decatur Cornice and Roofing Company, New Decatur, Ala., will build an addition, doubling its floor space.

The City Council of Bucyrus, Ohio, has decided to build a municipal lighting plant. About $90,000 will be invested.

Harry C. Egbert, of Teague, Tex., is reported as contemplating establishing foundry and machine shop at San Angelo.

An appropriation of $32,000 for improving municipal electric light plant at Logansport, Ind., has been authorized by Council.

A company has been formed in Rochester, N. Y., to erect two paper mills. N. H. Hoffman, of Little Falls, N. Y., is president.

It is reported that the American Watchcase Company, of Mansfield, Ohio, contemplates establishing a plant at St. Albans, W. Va.

D. J. Sinclair, Steubenville, Ohio, is said to be planning to establish a plant for the manufacture of steel tanks at Follansbee, W. Va.

The Union Rolling Mill Company, Cleveland, Ohio, is erecting a new plant at Newburg, a suburb of Cleveland, which will employ over 2000 men.

A smelting plant is to be erected for the Great Western Smelting and Refining Company, Chicago, Ill. The buildings will include foundry, smelter and refining plant.

The Perry Electric Company, Crooksville, Ohio, has been incorporated to establish an electric power plant. Incorporators, J. E. Horn, J. C. Horn, C. W. Rurik and others.

The Galesville (Ala.) Cotton Mills will soon commence construction of plant. This company was organized some months ago with J. Robert Henderson as president.

The Business Men's Association of Mishawaka, Wis., is negotiating with McCord & Company, Chicago, Ill., manufacturing automobile accessories, to locate in Mishawaka.

The Wheeling & Lake Erie Railroad Company, whose shops at Norwalk, Ohio, recently burned, will have same rebuilt on a larger scale. J. E. O'Hearne, Norwalk, is master mechanic.

The Grand Trunk Railway has had plans made for a wood machine shop at Port Huron, Mich., in connection with the car shop. J. L. Hodgson, Port Huron, master car builder.

The roundhouse of the Canadian Pacific Railway Company at Minnedosa, Man., was destroyed by fire. It will be rebuilt at once. Grant Hall, Winnepeg, superintendent of motive power.

The Chesapeake Gas Engine Company, Phoebus, Va., has been incorporated with $50,000 to manufacture and repair gas engines' etc. Richard Armstrong, Hampton, Va., president.

Work is to be started at once on the rebuilding of the Holton Power Company's machine shops at El Centro, Cal., which were destroyed by fire a short time ago. This will be double the size of the old one.

Contract has been let for the construction of machine shop, blacksmith shop and storehouse at Clovis, N. Mex., for the Atchison, Topeka & Santa Fe Railway Company. W. F. Buck, Chicago, Ill., superintendent of motive power.

The American District Steam Company is asking for bids on buildings to replace those at North Tonawanda, N. Y., recently destroyed by fire. These will include foundry, machine shop, casing mill, etc. Chas. H. Bishop, Lockport, N. Y., is general manager

The Napa & Lakeport Railroad Company has been incorporated with $2,000,000 capital to construct a railroad from Napa to Lakeport, Cal., about 90 miles. Steam or electric power will be used. C. W. Conlisk, Merchants Exchange building, San Francisco, is one of the incorporators.

S. Coulange, formerly designer for the Fabrique Nationale d'Armes de Guerre of Herstal, Belgium, and representative of Fenwick Freres, Paris, has opened an office at Rue Louvrex, Liege, Belgium, as consulting and constructing mechanical engineer in machine tools and special machinery. Would like to receive catalogs of American and foreign manufacturers.

# Want Advertisements

*Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday for ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents. Only bona fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.*

## Miscellaneous Wants

Caliper list free. E. G. Smith Co., Columbia, Pa.

Small, accurate drill jigs and dies built to order. R. Rosner, Madison, Wis.

Steel case hardened; modern methods. Boston Gear Works, Norfolk Downs, Mass.

We buy or pay royalty for good patented machine or tool. Box 282, AMER. MACHINIST.

Wanted—Orders for brass goods. Castings and finished product. Box 411, AMER. MACH.

Hand power bending tools, labor-saving, money-making. Estep & Dolan, Sandwich, Ill.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Machines designed; automatic, special. Practical working drawings. C. W. Pitman, 3519 Frankford Ave., Philadelphia, Pa.

Special machinery accurately built. Screw machine and turret lathe work solicited. Robert J. Emory & Co., Newark, N. J.

Well equipped sheet metal working plant will manufacture specialties, large or small. Can also undertake sale of goods if desired. Box 439, AMERICAN MACHINIST.

Special machinery and duplicate machine parts built to order; tools, jigs and experimental work; complete modern equipment. MacCordy Mfg. Co., Amsterdam, N. Y.

Manufacturing in Canada. Light machinery. Have good shop, low rental, equipment almost new. Good town; good shipping facilities. Would like a proposal. Box 434, AMER. MACH.

Toolmakers' white aprons; finest material, brass eyelets, one large pocket, micrometer, scale, pencil pockets. Send your height. Price 50c. Postage 10c. O. K. Specialty Co., Box 212, West Orange, N. J.

A large English firm of machine-tool importers having showrooms and offices in Great Britain, France, Italy and Japan, is wanting good agencies for machine tools of all kinds. Apply Box 189, AMERICAN MACHINIST.

Machinery built to order and by contract; special parts made; gear cutting, automobile and pattern work, punch press and screw machine work, tools, dies, etc. Blair Tool and Machine Works, West and Morris Streets, New York City.

Wanted—First-class machine shop in the most rapidly growing city on the Pacific coast: Eugene, home of the State University and hub of the famous Willamette Valley. Address Department M B, Commercial Club, Eugene, Oregon.

## Situations Wanted

*Classification indicates present address of advertiser, nothing else.*

CONNECTICUT

Wanted—Position by experienced mechanical draftsman. Box 435, AMER. MACHINIST.

Successful designer, draftsman and foreman, age 35, on special labor-saving machinery and tools, wants position. Box 440, AMER. MACH.

MASSACHUSETTS

Draftsman and designer, practical mechanic, technical education, wide experience. Box 414, AMERICAN MACHINIST.

Position as shop manager by practical mechanical engineer with excellent experience and references. Can buy interest in good prospect. Box 393, AMERICAN MACHINIST.

Position by an American as superintendent or assistant superintendent. Practical man with drafting-room experience. Executive ability. Reference. Box 386, AMER. MACH.

NEW JERSEY

Patternmaker, foreman or otherwise. Good all round man. Have run open shop for years without friction. Box 447, AMERICAN MACH.

I. C. S. graduate (School of Mechanical Engineering), experienced machinist and toolmaker on general machine and electrical work, wishes position as draftsman. Box 437, AMER. MACH.

NEW YORK

Superintendent, good mechanic, live man desires change. Box 430, AMER. MACHINIST.

Tool and die maker, 30, married, desires position. References. "K," Box 438, AMERICAN MACHINIST.

First-class mechanical draftsman, Corliss or high speed engines, wants to change position. Box 433, AMERICAN MACHINIST.

Machine shop foreman in large gas engine shop (50 to 1000 h.p.) wants position. Good executive ability, energetic. Reference, present employers. "Warren," AMERICAN MACHINIST.

First-class superintendent, good executive ability, large experience, desires change. Reference, present employers. "H. S.," AMERICAN MACHINIST.

Foreman, successful in producing first-class work at satisfactory cost in gas, gasolene and fuel oil engine; also in testing same, desires change. Box 445, AMERICAN MACHINIST.

Designer, age 31, graduate engineer, 11 years' broad experience fine apparatus, automatic special machinery, fixtures; very good experimental work. Go anywhere. Box 446, AMERICAN MACHINIST.

Mechanical engineer, Stevens (29), Jun. A. S. M. E. Five years' experience in shop work, mill construction, designing special machinery and piping layouts for power plants. Desires suitable position in the East. Address "Factory Engineer," care AMERICAN MACHINIST.

Mechanical engineer is open for engagement as superintendent, master-mechanic or general foreman. Technical education and large experience in the designing and construction of small interchangeable machinery, special tools and labor-saving devices. "G. W. N.,"-732 Marcy Ave., Brooklyn, N. Y.

Toolmaker and machinist, thoroughly competent mechanic with 18 years of experience on all kinds of tool work, jigs, fixtures and dies, able to construct labor-saving tools, etc.; can take charge of tool room; wants position, will go anywhere; first-class references. Box 449, AMERICAN MACHINIST.

Foreman or assistant superintendent, first-class man, 18 years' experience as machinist, toolmaker and general foreman, acquainted with the practical details of shop management and able to bring manufacturing and general work to lowest cost. Young, active. Wants to connect with reliable New York firm. Box 442, AMERICAN MACHINIST.

First-class mechanic, reliable and energetic man with 15 years' experience in the manufacture of valves, hydrants, dies, steam and water gages and special machinery for the same, as well as 15 years in machine and tool works, desires position as master mechanic or general foreman, valve works preferred. Thoroughly familiar with handling of large force of men. Address all communications to Jacob Steiner (Personal), 412 E. 52 St., New York City.

OHIO

Young man, technical and practical knowledge of machine tools, desires Middle West agency for good company. Box 443, AM. MACH.

PENNSYLVANIA

Expert cost accountant and systematizer desires an executive connection with manufacturing concern. Up-to-date methods and satisfactory results guaranteed. Box 304, AMERICAN MACHINIST.

## Help Wanted

*Classification indicates present address of advertiser, nothing else.*

ILLINOIS

Wanted Machinist—Young man for position as assistant foreman, having direct charge of men in shops building automatic engines. Box 441, AMERICAN MACHINIST.

Wanted—Patternmaker and draftsman. Experienced in gasolene engines. One that has progressive ideas. Full particulars in first letter. Box 424, AMERICAN MACHINIST.

MASSACHUSETTS

Wanted—A designer of small tools and jigs in a factory in western Massachusetts. Box 448, AMERICAN MACHINIST.

Wanted—Storekeeper for machine shop. Must have had similar experience and be familiar with shop supplies. Good chance for energetic young man who is systematic and quick. Box 421, AMERICAN MACHINIST.

NEW YORK

Wanted—Drop forge die sinkers. Good live men and good workers. Address Maxwell-Briscoe Motor Co., Tarrytown, N. Y.

Wanted—Draftsman experienced on small tool jig and fixture work; also one having experience on special machine designing. Address, giving full particulars, Box 431, AMER. MACH.

OHIO

Wanted—A superintendent and shop manager, who understands high-grade machine tool work in the milling machine class. Will sell part interest to the right man. Business established six years, and thoroughly advertised. Box 436, AMERICAN MACHINIST.

PENNSYLVANIA

Wanted—Foreman for automatic screw machine department. Applicants must be competent to figure out and make cams for Nos. 00, 0, 1 and 2 Brown & Sharpe screw and turret forming machines. State experience, giving list of previous employers, references, age, salary expected and photograph. Address Box 444, AMERICAN MACHINIST.

WISCONSIN

Wanted—Two or three first-class designers of excavating machinery and wrecking cranes. Must be able to make computations and independent designs. With reply please furnish references and state salary required. The Bucyrus Co., South Milwaukee, Wis.

# For Sale

*Classification indicates present address of advertiser, nothing else.*

For Sale or Rent—Foundry, machine and wood shops with machinery in town of 5000. Box 227, Bergen, N. Y.